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Technical Report

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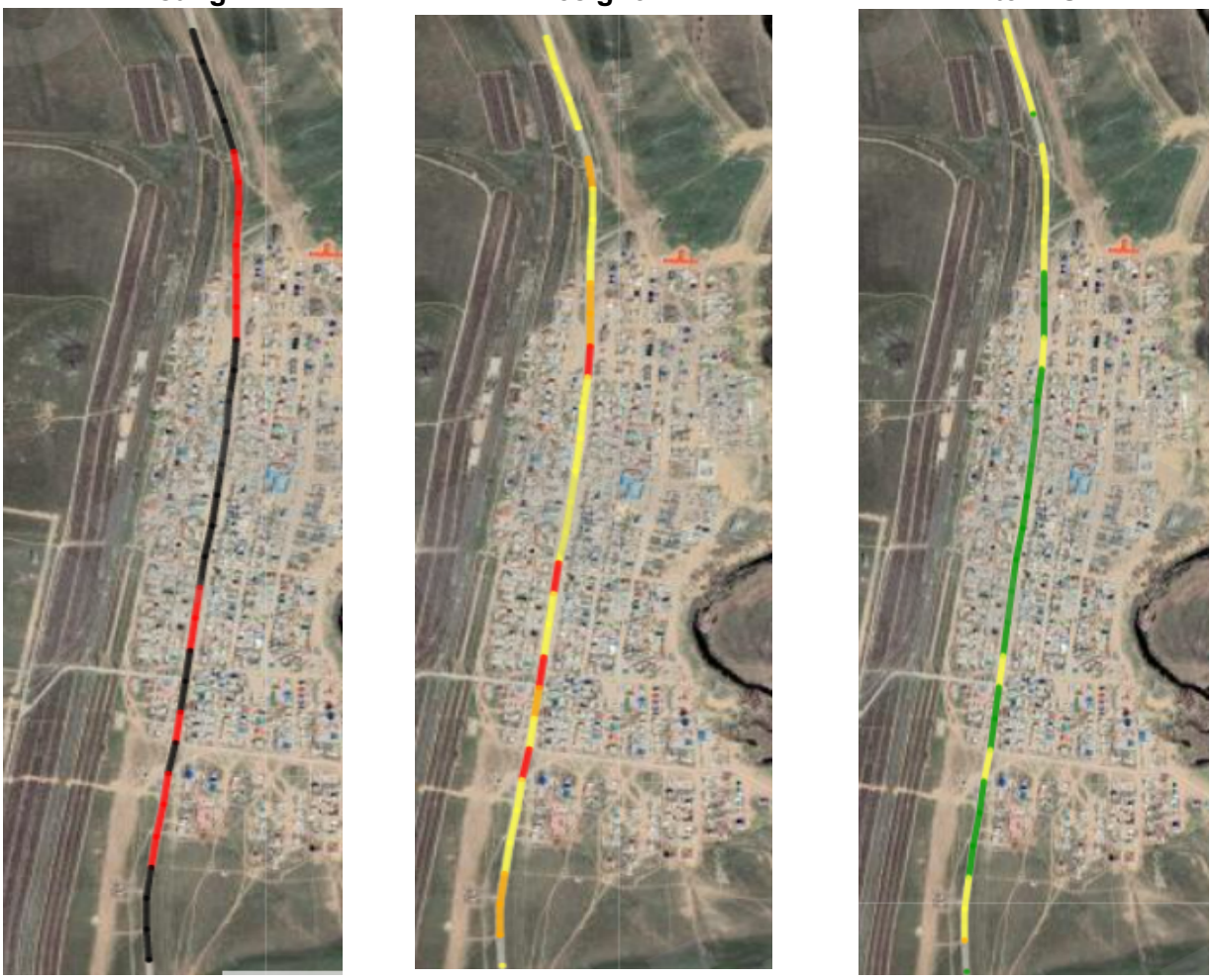

ROAD SAFETY AUDIT OF A SECTION OF ROAD A27 THROUGH BESTAMAK

REPORT

Prepared by:

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CURRENCY EQUIVALENTS

(as of June 09, 2023)

Currency unit	–	Kazakhstan KZT (KZT)
KZT 1.00	=	0,0022$
$1.00	=	447.66 KZT

NOTE

In this report, "$" refers to US dollars.

ABBREVIATIONS

RSA	–	Road Safety Audit
JSC	–	Joint-Stock Company
RS	–	Road Safety
RTA	–	Road Traffic Accident
RSI	–	Road Safety Inspectorate
CoR	–	Committee of Roads
KAZ	–	JSC National Company KazAvtoZhol
ADB	–	Asian Development Bank
MIID	–	Ministry of Industry and Infrastructure Development
Project	–	Project section A-27 passage through Bestamak village
CAREC	–	Central Asian Regional Economic Cooperation Program
iRAP	–	International Road Safety Assessment Program
SR4D	–	iRAP Star Rating for Road Projects
UD ($)	–	U.S. dollar
Tenge/tg.	–	National currency tenge
ths.	–	thousand
mln.	–	million
bln.	–	billion
km	–	kilometer
m	–	meter
un.	–	units

CONTENT

TABLES

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I. SUMMARY OF AUDIT RESULTS

1. **General information.** This report is part of the Project Reconstruction of the republican significance road A-27 "Aktobe - Atyrau - border of the Russian Federation (to Astrakhan)", km 11-52, which includes a road safety audit of a 2 km section passing through the settlement of Bestamak. According to the analysis of the technical and economic indicators of the project site, 22 key points (intersections, junctions, roadside facilities, etc.) were identified, which were given special attention during the road safety audit. In general, 20 targeted recommendations were formed and within the framework of the iRAP for Design project, a set of recommendations was proposed to improve the star rating of more than 3 iRAP stars from 72% to 100%.
2. This report consists of 5 sections:
    1. Project safety assessment methodology;
    2. General description of the project;
    3. General road safety situation in the project area;
    4. Work plan.
3. As part of the implementation of consulting services, the experts visited the above section of the highway, performed field measurements, held meetings with the main stakeholders and a local entrepreneur - the owner of the Express store in Bestamak village.
4. Field work was carried out to survey the existing road using the Mapillary platform, which was subsequently used in the iRAP star rating of the road safety assessment on the platform https://vida.irap.org/.
5. Based on the results of the field survey of the site, a preliminary action plan was presented to improve road safety conditions along and on the above section, which runs through the territory of the settlement of Bestamak, which satisfied the representatives of the Aktobe branch of JSC “NC “KazAvtoZhol”, CSC Dongsung Engineering Co.Ltd / LLP "M50 Consulting Group", Contractor JV "SP SineMidasStroy LLP / JSC Todini Costruzioni Generali S.P.A." and local residents of the village of Bestamak.
6. During the development of a detailed action plan, a meeting was held with the Project Designer, during the conversation and discussion with whom, preliminary agreements were reached on the proposed changes to improve road safety conditions on a 2 km section along the Bestamak settlement.

7. **Description of the road safety situation in Kazakhstan.** In Kazakhstan, from 1991 to 2022, 474.5 thousand road accidents were recorded, in which 90.8 thousand people died, about 574.5 thousand people were injured of varying severity. At the same time, 75% of all accidents were recorded in cities and towns, 16% of accidents on roads of republican significance and 10% of accidents on local roads. Whereas the total volume of economic losses from road accidents for 2015-21 amounted to 3.6 trillion tenge. The key reasons, according to national statistics, are: speeding (27.3%), violation of pedestrian crossings (14.5%), oncoming passing and overtaking (4.5%), non-compliance with signs and road marking (4.2 %) and drunk driving accounts for 2.1%.

8. **Traffic violations in Kazakhstan**. In accordance with the data of legal statistics of the General Prosecutor's Office of Kazakhstan for 2017-2021, 21.3 million administrative offenses in the field of traffic rules were registered, of which the main:

- exceeding the permitted speed - 7.1 mln.
- not wearing a seat belt - 1.38 mln.
- unsafe behavior of pedestrians - 995.6 ths.
- use of cell phones while driving - 696.8 ths.
- drunk driving - 132.9 ths.
- driving in an overtired state - 27.3 ths.

In this regard, for the project site as “Main Street”, under the RSA, special attention is paid to 1) speeding and 2) unsafe behavior of vulnerable road users (pedestrians and cyclists).

9. **Road accidents at the project site.** In accordance with the accident data for the A-27 project section in the Aktobe-Kandyagash section, 220 accidents were committed in this section in 2015-2022, in which 91 people died and 405 were injured. That is, very dangerous indicators

with an average annual number of 28 road accidents with 11 dead and 51 injured, and the severity of road accidents per 1 km is 0.32 road accidents, 0.13 dead and 0.6 injured.

For the section of passage through the settlement of Bestamak, 19 accidents were committed in 2015–2022, in which 9 people died and 38 were injured. At the same time, the severity of road accidents per 1 km of the project section was 0.59 road accidents per year, 0.28 dead and 1.19 injured per year, which is 2 times higher than for the entire Aktobe-Kandyagash section.

The project site is dominated by collision (58%), rollover (21%) and pedestrian (16%) accidents, accounting for 100% of deaths and 97% of injuries. The key causes of traffic accidents are speeding (21%), driving into the oncoming lane and maneuvering (37%), violations of pedestrian crossings (11%). For these reasons, 10% of people died and 77% of people were injured. While the total economic losses from road accidents for 2015-21 amounted to 3.4 billion tenge.

In general, in accordance with the CAREC Guideline No.1 Road Safety Audit, the section is classified as “Unacceptable” according to the severity of the road safety problem, which must be eliminated regardless of cost.

10. **General RSA and SR4D recommendations.** The processes, approaches of this audit were carried out in accordance with the CAREC Road Safety Engineering Manuals, which provide for generally accepted concepts and standardized strategies for managing road risks:

- No. 1 "Audit of road safety".
- No. 2 “Safer Road Works”.
- No. 3 "Roadside hazard management"
- No. 4 "Pedestrian safety".
- No. 5 "Star ratings of road safety audit".

General RSA and SR4D recommendations. In general, 20 key targeted recommendations have been formed regarding the basic dangerous elements in the project road: the safety of the location of road attributes, road markings and signs, speed control at potentially dangerous sections (crossroads, pedestrian crossings), risks of crossing domestic and wild animals, and more.

Table 1 – General RSA and SR4D recommendations

Trend	Number of dangerous areas	Recomendation
1. Speed rate	2400 m	Within the framework of paragraph 19 of the CAREC Guideline No. 4 “Pedestrian Safety” and iRAP modeling, in order to achieve 4 stars, it is recommended to reduce the speed limit from 60 to 50 km/h from PK 163 to PK 187 on the road section through Bestamak village.
2. Traffic management and speed control	4	At 3 road crossing, traffic light objects with a vehicle motion sensor system (for a secondary road at crossings and junctions) to reduce the risk of traffic jams for vehicles moving along the main carriageway. Supplement traffic lights with the FRED system, which forces speeding drivers to stop and reminds them of speed limits.
3. Traffic management on a secondary road	1500 m	It is recommended to increase the pavement width on the secondary road from 4.0 to 5.7 m between PK 168+90 to PK 184+00 by changing the barrier fencing unit, lighting poles, drainage tray and noise screen.
4. Opening and closing of secondary road ramps	2	In order to reduce traffic at the X-crossing PK 168+76, provide an additional exit to the right with one-way traffic at PK 164. Also exclude the possibility of vehicles leaving at the T-crossing PK 175+68, keeping the pedestrian crossing. Thereby reducing the risk of side collision of local and transit vehicles.
5. Offset marking of pedestrian crossings	2	It is recommended to separate the pedestrian crossing between T-crossings at PK178+96.29 (left) and PK179+38.38 (right) and place them on each side of the exit. It is also proposed to move the pedestrian crossing from PK 182 between bus stops to X-crossing at PK 181 equipped with a traffic light.
6. Installation of prohibition signs for pedestrians	4	At 2 X-crossings PK 168+95 and PK 181+40, install sign 3.10 “Pedestrian traffic is prohibited” on both sides of the road.
7. Increased visibility at intersections	4	Reducing the set speed to 50 km/h will reduce the required visibility distance for stopping from 85 meters to 75 meters from the edge of the secondary road. Due to which, in local areas, the total length of the installation of the noise barrier will be

Trend	Number of dangerous areas	Recomendation
		reduced by 321 linear meters. (from 3057 l.m. to about 2736 l.m.) without damage to the local population. Subject to the keeping of the barrier fence in these places.
8. Metal barrier fences	4	To improve the safety of metal fences, it is proposed to use end and side damping devices in accordance with ST RK EN 1317-4-2014 at 4 local points at the entrances to Bestamak settlement. The remaining barrier fences inside the settlement of Bestamak according to paragraph 246 of the CAREC Guideline No. 3 "Management of Roadside Obstacles" of the "fishtail" type in sections with a speed of less than 80 km/h are proposed to be left, marking them with chevrons.

11. **General results of RSA and SR4D.** As a result of comparing the proposals of the original project and the proposals of the road safety audit, the coding matrices of road attributes are formed. The results of the star rating for cars on the existing projected road and taking into account the proposals of the safety audit made it possible to improve the values of more than 3 stars iRAP from 72% to 100%.

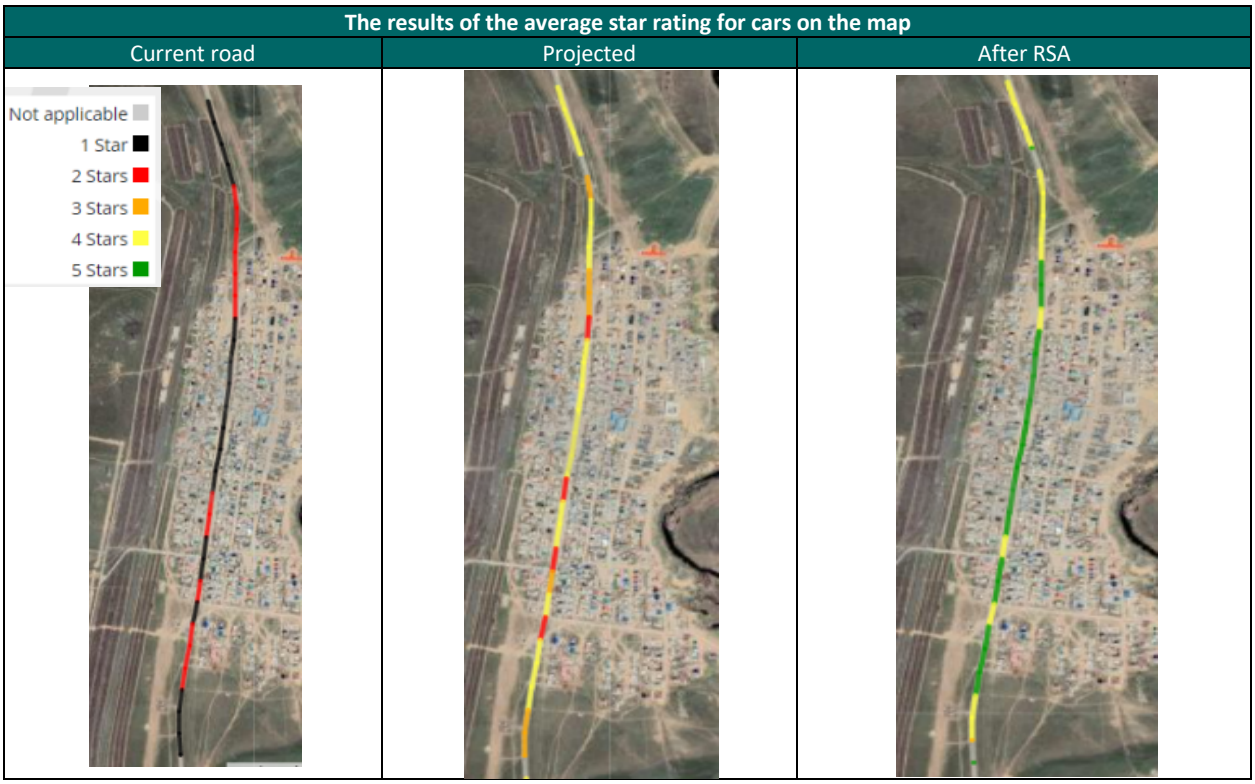


Figure 1 - The results of the average star rating for cars on the map

12 Calculation of traffic accident consequences in VIDA on an existing project road and safety audit proposals, "fatalities and serious injuries" risk was optimized by 17% from 5.2 to 4.3 per year between the design road and recommendations. Whereas this indicator with the current road is 50% for the project and 59% for the road, taking into account the road safety. Within 20 years, the recommendations will save the lives of 3 people in fatal road accidents and 16 people with serious injuries.

Table 2 – Comparison of crash consequences before and after RSA/SR4D

	Current road	Projected	After RSA	Difference
Risk of injury and death	10.5	5.2	4.3	-0.9
Risk of fatalities	0.9	0.9	0.8	-0.1
Risk of serious injury	9.6	4.3	3.5	-0.8

II. PROJECT SAFETY ASSESSMENT METHODOLOGY

13 A group of national experts was mobilized to implement the tasks.

Table 3 – List of mobilized experts

FULL NAME	Field of activity	Должность
Daulet Aspanbetov	RSA, IRAP	National RSA and iRAP Expert (team leader)
Bauyrzhan Zheksenbekov	RSA, Project	National road safety specialist
Birzhan Bajakyshev	RSA	Engineer surveyor

A. Road survey

14 Road survey is carried out using mapillary software. The purpose of a road survey is to obtain location-referenced video recordings of the road network, on the basis of which and design decisions the parameters of road attributes are encoded. Thus, road photography is a necessary input for a star rating, which is based primarily on the parameters of the road. The results of road surveys were also used as part of the analysis of crash sites.

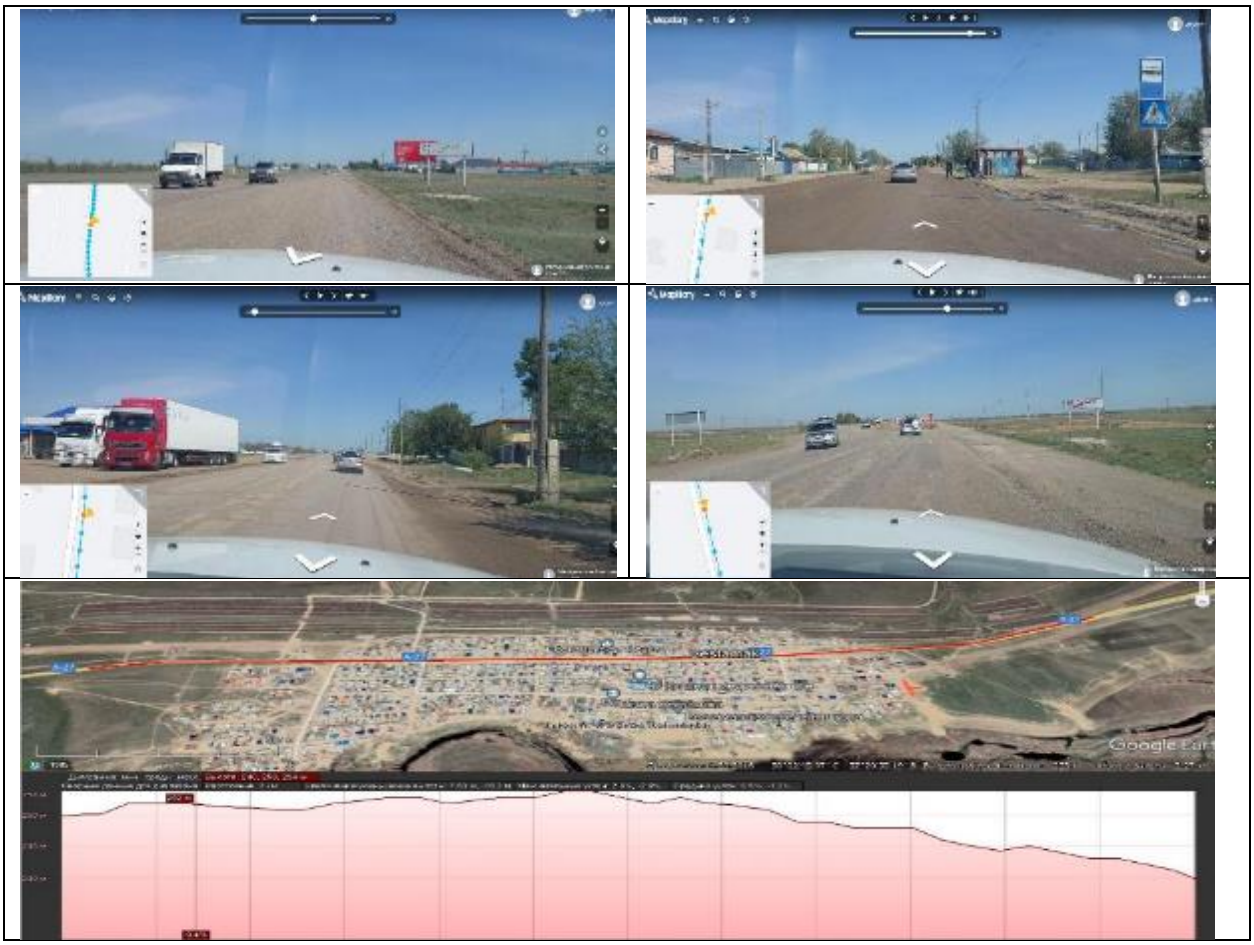


Figure 2 – Field trip to the road

15 The following table shows the length of the roads that are surveyed and placed in the mapillary.

Table 4 – List of roads to be surveyed

Region	Road	Length, km
Aktobe	A-27	3.0
Aktobe	st. Bokenbay batyr, Bestamak village	1.6
	Total:	**4.6**

C. Description of the Road Safety Audit Methodology

16 In accordance with the terms of reference, the Consultant studied the purpose and function of this road in the overall hierarchy, route selection, applicable standards, number and types of road crossing. In addition, the Consultant assessed the basic principles and design of the drawings, including longitudinal and transverse alignment, sight lines, transverse breaks, the needs of vulnerable users, layout, connectivity, lighting, etc. In light of this analysis and the design decisions envisaged in this project , recommendations will be offered to improve the design to minimize the risk of accidents on this section of the road.

17 In accordance with the approved strategy, road safety audits should be conducted for all CAREC road projects. Road safety audit will be based on the CAREC Road Safety Engineering Manuals:

No.1 Road safety audit;
No.2 Safer road works;
No.3 Roadside hazards management;
No.4 Pedestrian safety.
No.5 Road Safety Audit Star Ratings.

These manuals provide practical guidance for the road safety audit process in CAREC countries for all CAREC road projects.

Figure 3 - CAREC Road Safety Engineering Manuals

18 In accordance with Guideline No. 1 Road Safety Audit, all information received, the geographic location of the road, the size of traffic flows and their composition, as well as other relevant information, were considered. The general process of conducting the RSA by the Consultant is shown in Figure 4.

Figure 4 - Road safety audit process

19 The audit used checklists designed to reduce the risk that important security issues might be overlooked during the audit.

20 All information provided (documentation volumes) is taken into account and checked to find the best cost-effective design solutions.

21 In accordance with Manuals No.3 Roadside Hazard Management, the project site will be assessed under the concepts of "Sparing roadside" and "Free roadside" as part of a 5-step roadside strategy.

22 The free roadside concept allows engineers to design and maintain a roadside area that is passable for a vehicle and free of hazards. This concept does not prevent runoffs, but it does mitigate their effects. Safety is improved by creating a clear zone in which an out-of-control vehicle can slow down, avoid hitting stationary objects, and in which the driver can regain control.

23 The 5-step roadside hazard management strategy (see Figure 5) offers five options for addressing each identified hazard:

- удержать транспортные средства на дороге;
- удалить опасный объект;
- переместить опасный объект;
- изменить опасный объект;
- оградить опасный объект.

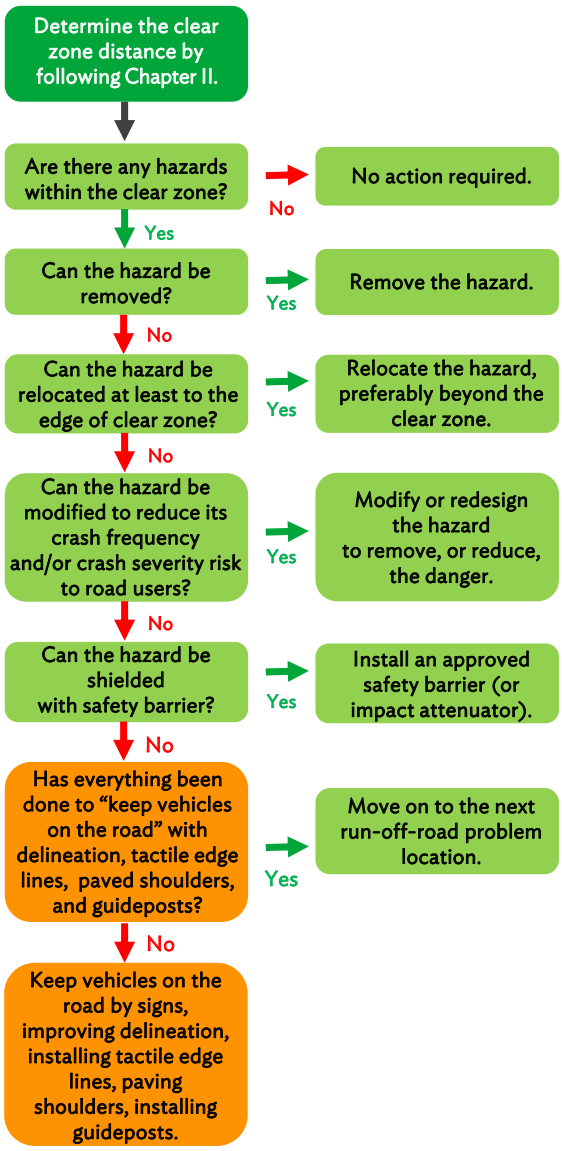


Figure 5 - Flowchart of a 5-step Roadside Hazard Management Strategy

24 As part of the Safety Audit, much attention is paid to the safety of vulnerable road users for compliance with Manual No. 4 Pedestrian safety. It focuses on physical road infrastructure that can help pedestrians cross and walk on roads safely.

D. Description of iRAP and SR4D methodology

25 **The International Road Assessment Program (iRAP)** is a registered charity dedicated to saving lives by making roads safer.

26 **The star rating** is an objective measure of the likelihood of a traffic accident and its severity. The focus is on identifying and recording the road attributes that affect the most common and severe types of crashes based on evidence-based scientific research. Thus, the level of risk to road users on a particular network can be determined without the need for detailed crash data, which is often the case in low- and middle-income countries where data quality is poor. Studies show that a person's risk of death and serious injury is highest on a one-star road and lowest on a five-star road.

27 iRAP protocols:

Crash risk mapping uses detailed crash data to illustrate the distribution of reported deaths and serious injuries across the road network.

Star ratings provide a simple and objective assessment of the level of safety provided by a road project.

Mortality score mapping illustrates the distribution of the expected number of deaths and serious injuries across the road network.

Safer Roads Investment Plans (SRIPs) are based on approximately 90 proven road improvement options to create affordable and cost-effective life-saving infrastructure options.

Performance tracking allows you to use star ratings and accident risk mapping to track road safety performance and set policy positions.

28 Figure 6 below shows the process used to create star ratings and safer road investment plans (SRIPs), which can be used as part of a systematic, proactive approach to assessing risk and upgrading road infrastructure based on research into where severe crashes are likely and how they can be prevented.

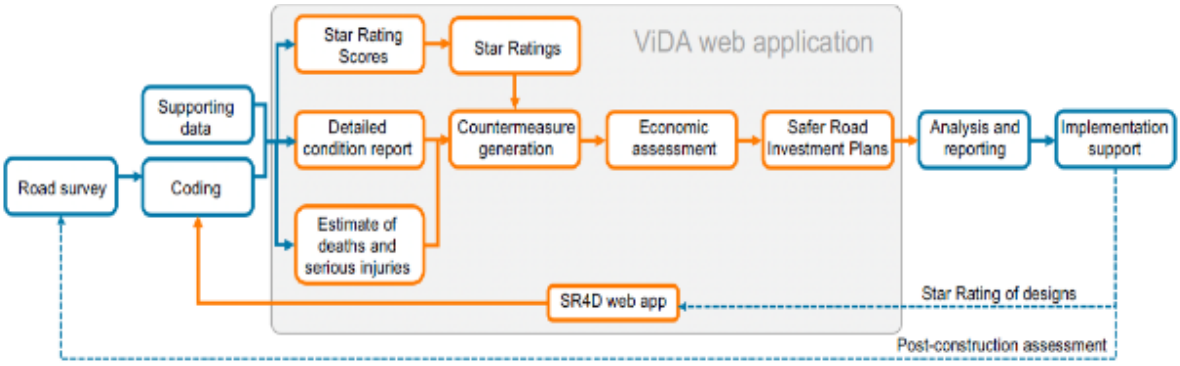


Figure 6 - Star Ratings and Investment Plans (SRIP) Creation Process

29 Interaction between road safety audit and iRAP. Each road project safety assessment system has its own strengths and limitations, which together can complement each other well (see Figure 7).

30 CAREC Manual No.5 Road Safety Audit Star Ratings put together key points for integrating approaches.

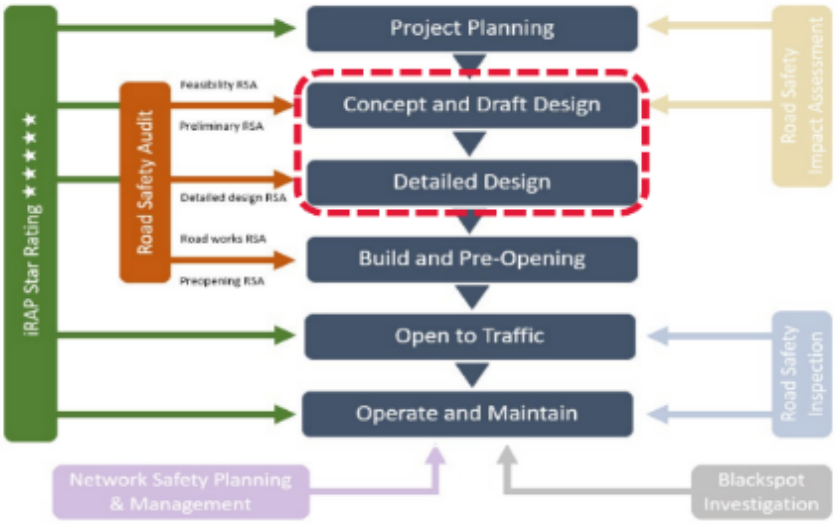


Figure 7 - The system of interaction of RSA and SR4D

31 In accordance with the terms of reference for the project site, the consultant set the following goals:

- Design decisions must receive at least 3 stars for all road users.
- The project should provide an improvement in the star rating for all road users compared to the existing road.
- The estimated number of deaths and serious injuries associated with the project should be less than on the existing road.
- The estimated number of fatalities and serious injuries should be lower than the average for this type of road.

32 The project will use the Star Rating for Designs (SR4D) Web App User Guide (available at: https://resources.irap.org/Specifications).

33 There are five steps to create star ratings using the SR4D web application as shown in the flowchart below. For ease of use, the structure of this manual follows the following steps (see Figure 7).

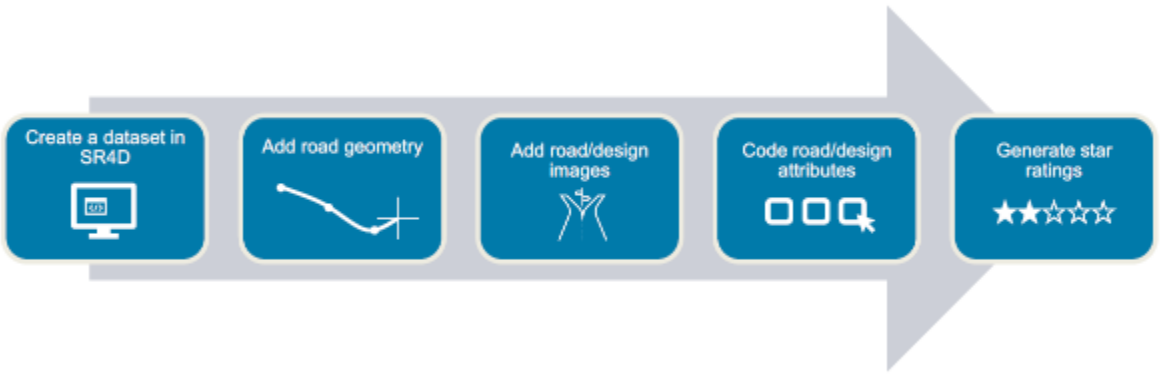


Figure 8 - Star Rating for Designs (SR4D) Web App process

III. GENERAL DESCRIPTION OF THE PROJECT

A. Road status

34 The section of the Aktobe-Kandyagash road is part of the A-27 highway "Aktobe-Atyrau-Russian border (to Astrakhan)", as one of the key economic corridors that contribute to the integration of Kazakhstan into the regional and world economy within the framework of the Central Asian Regional Economic Cooperation (CAREC) is an integral part of the CAREC Corridors 1 and 6 Connector Road Project.

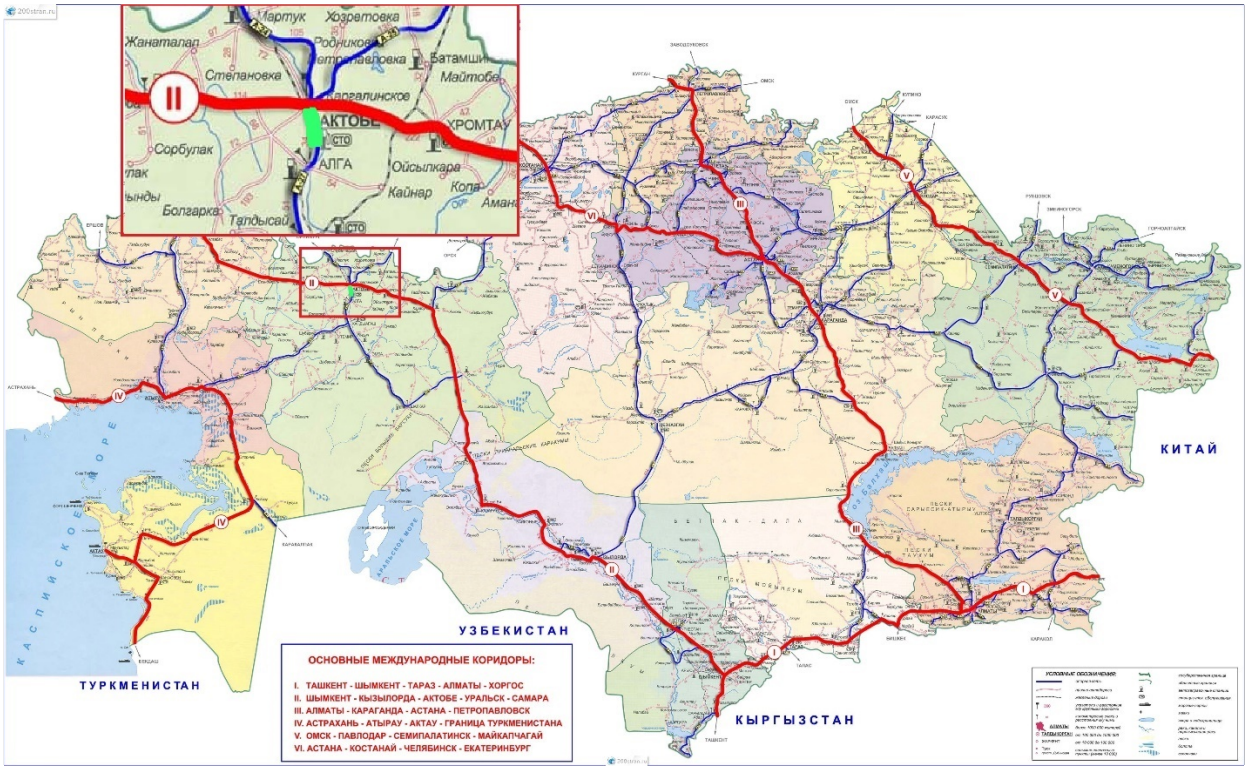


Figure 9 - Geographical location of the Aktobe-Kandyagash road project

B. Technical and economic indicators

35 The most difficult section of the route runs within the boundaries of the settlement of Bestamak km 26+391 - km 29+40, which is determined by the terms of the consultant task for conducting a road safety audit. It is characterized by its passage in close proximity to residential development, a large number of communications and networks, and typical for roadside settlements, junctions, secondary roads and spontaneous exits. Thus, the function of the road section is characterized as the Main Street.

36 The scheme of the project section and the adopted schemes for the passage of the project road allow us to present a general idea of the situation and the design decisions made. A detailed analysis of all design solutions for compliance with road safety requirements was carried out as part of the Road Safety Audit.

Figure 10 – Scheme of the route of the road A-27 through the settlement of Bestamak

37 The main roadside service is also concentrated in the area of the surveyed area along the settlement of Bestamak. Starting from the entrance to the village of Bestamak at km 27+62, on the left side there is a tire shop and a cafe at km 27+80. Lighting of sites and access roads is completely absent. The surrounding area is uncovered. The state of the service is regarded as satisfactory, and poorly equipped.

38 The data presented in the project documentation correspond to the results of the survey. In particular, at km 27+401 there is a junction on the left side of a secondary road with asphalt concrete surface. The width of the carriageway is 5.40m. The condition of the pavement is unsatisfactory, there are multiple deformations of the asphalt concrete pavement.

39 On the left side of the highway there are a large number of shops located at km 27+381, km 27+617, km 27+920, km 28+9, km 28+66.

40 The right side of the buildings in Bestamak, link to the road, also has a large number of roadside service facilities. These include: a service station located at km 27+465, a group of shops located at km 27+499, km 27+692, km 27+933, km 28+366, km 28+583, a mosque at km 27+890 and catering facilities - Cafe Express (km 27+709), Urker (km 28+464), Karavan (km 28+484).

41 The service station at km 27+465, located on the right side of the road, consists of a small car workshop and a tire repair shop. The object has a canopy made of a profile metal sheet on metal racks, with lighting in the roof. The site does not have clear contours of the race. The area in front of the service station is covered with fine gravel.

42 At km 27+890, on the right side of the road, there is a mosque.

43 Parking spaces and rides are not provided. The territory of the mosque has a metal fence 1.2 m. The area of the mosque is covered with concrete blocks. A 1.5 m wide footway leads directly to the entrance of the fence, and there is good external illumination with a searchlight.

44 On the right side of the road axis in the village of Bestamak, the most visited catering establishments are the cafe Express (km 27+709), Urker (km 28+464) and Karavan (km 28+484)). Café "Express" km 27+709 is a complex building including a shop and a cafe. The entrance to the cafe does not have a clear outline, there is no paving of the territory and parking spaces. The territory of the cafe is surrounded by a decorative fence 1.3 m high, which is adjoined by a sidewalk 1.5 m wide. The territory of the Express cafe has partial external lighting.

45 The road infrastructure of Bestamak settlement is underdeveloped and needs to be reconstructed; a significant part of secondary road junctions does not have asphalt concrete pavement. The junction of minor roads without asphalt concrete pavement are located at km 28+60 and 28+386 of the road left side. These junctions are sandy country roads with an average width of 4-4.5 m.

46 At km 28+426 the road on the right side intersects with a minor road leading to the railway crossing and the oil loading station. The surface of the secondary road is asphalt concrete, the average width is 6.5 m, the condition is satisfactory.

47 At km 28 +580, a graded road adjoins the road on the right side, leading to the GRS-3 gas distribution station. Graded road is in good condition. The average width of the carriageway is 6m.

48 At km 28+630 the road intersects with the secondary road leading to the Eset Batyr mausoleum. This section of the road with a length of 4 km is of great cultural importance for the population, on the territory of the necropolis there are all conditions for pilgrimage. The junction has an asphalt concrete pavement 6 m wide, the condition of the pavement is not satisfactory.

49 At km 28+749, on the left side of the road, 6.65 m away, there is a monument to Eset Batyr. The facilities have a metal fence of a rectangular shape (6.5x13.3) with a height of 1.2 m. The territory of the site is covered with paving stones and has external lighting. On both sides of the road adjacent to the monument, in order to create pockets for stopping and parking vehicles, widenings were created from km 28+699 to km 28+792.

50 At km 28+697 and km 28+788, on the right side of the road, there is an entrance and exit to the territory of the former gas station, the exits and the site are asphalted and are in a satisfactory condition. There are no buildings on the site, which led to its use as a recreation area. On the territory of the former gas station there is no infrastructure for recreation, as well as lighting.

51 The main indicators of the project section are presented in Table 5. According to the preliminary analysis of the indicators of the project section, more than 22 key points were identified, which were paid attention to during the road safety audit.

Table 5 - Key indicators of the project site

No.	Indicator	Bestamak settlement		
1	Technical and economic indicator	DED	Предварительный эскизный План	По итого аудита
2	Road category	Ib	Ib	Ib
3	Number of traffic lanes, pcs.	2x2	2x2	2x2
4	Subgrade width, m	19.8	19.8	19.8
5	Roadway width, m	15	15	15
6	Shoulder width, m	2.4	2.4	2.35
7	The width of the reinforcing part of the curb, m	0.5	0.5	0.5
8	Coating type	SMA	SMA	SMA
9	Number of connections, pcs.	5	6	5
10	Number of crossing, pcs.	1	2	2
11	Number of exits, pcs	0	1	2
12	Number of roadside sites / (gas stations, cafe, service stations), pcs.	5	5	5
13	Number of bus stops	4	4	4
14	Estimated speed, km/h	60	60	50
15	Number of traffic lights pcs.	3	4	4
16	Including motion sensor	0	0	4
17	Secondary road width, m	4.5*4.5	4.0(4.5)*4.0(4.5)	5.7*5.7
18	Pavement width, m	1.5	1.0	1.3
19	Pedestrian crossings, pcs	3	4	5

IV. GENERAL SITUATION OF ROAD SAFETY IN THE PROJECT AREA

A. Description of the road safety situation in Kazakhstan

52 In Kazakhstan, from 1991 to 2022, 474.5 thousand road accidents were recorded, in which 90.8 thousand people died, about 574.5 thousand people were injured of varying severity. Dynamics of deaths in traffic accidents has a downward trend with main peaks in 1991 and 2012-2013 (see Figure 11). Along with this, an upward trend in the number of people injured is clearly visible. (see Figure Figure 13).

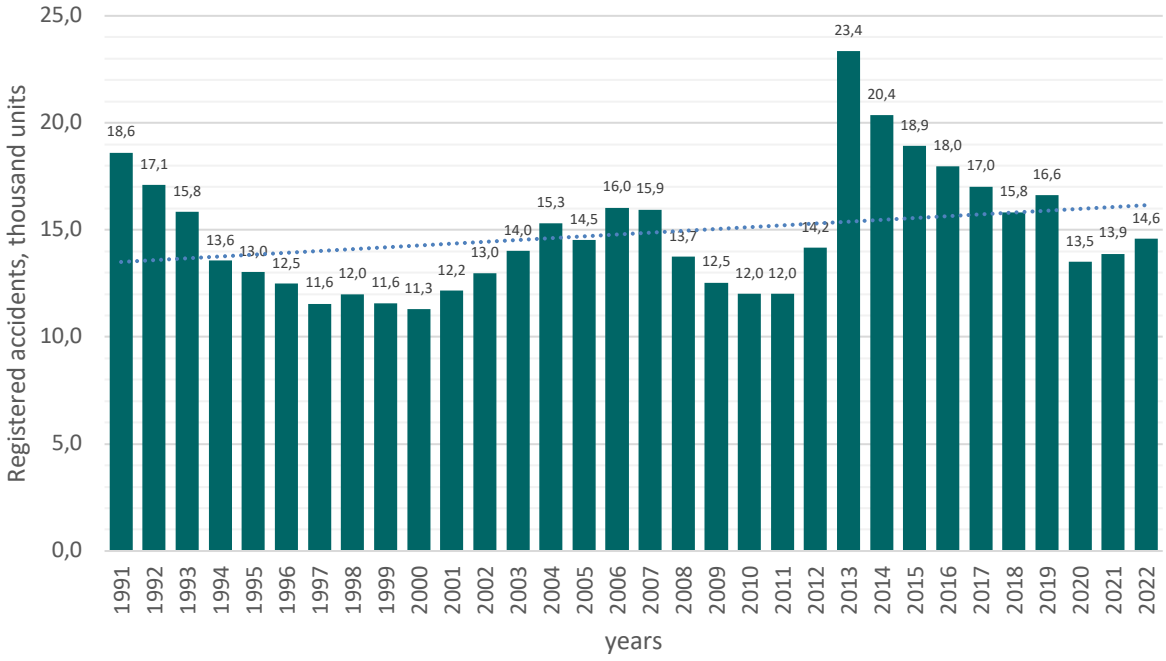


Figure 11 - Dynamics of the number of road accidents 1991–2022, units

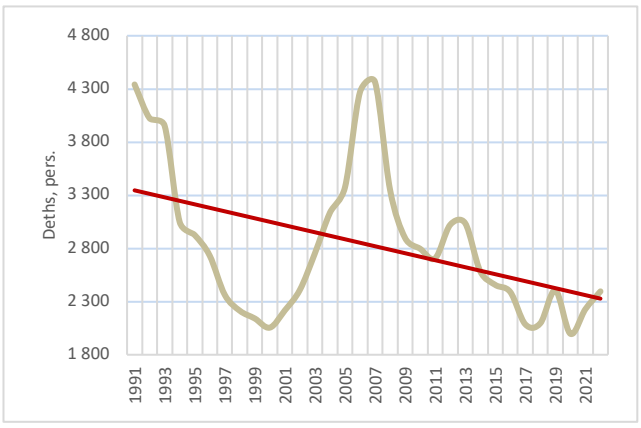


Figure 12 - The dynamics of the number of deaths

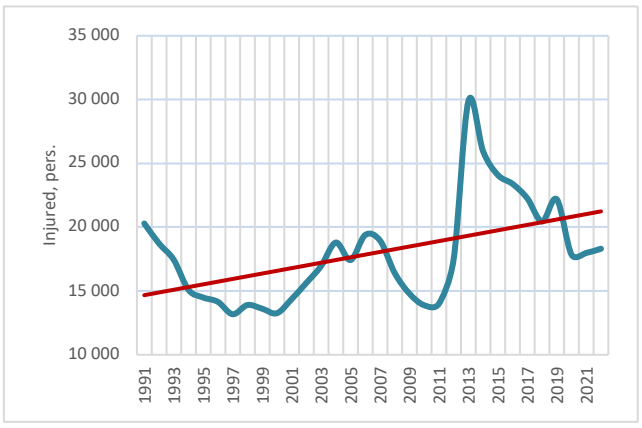


Figure 13 - Dynamics of the number of injured

53 At the same time, 75% of all accidents were recorded in cities and towns, 16% of accidents on roads of national importance and 10% of accidents on local roads. The key reasons, according to national statistics, are: speeding (27.3%), violation of pedestrian crossings (14.5%), oncoming traffic and overtaking (4.5%), non-compliance with signs and markings (4.2 %), being intoxicated (2.1%).

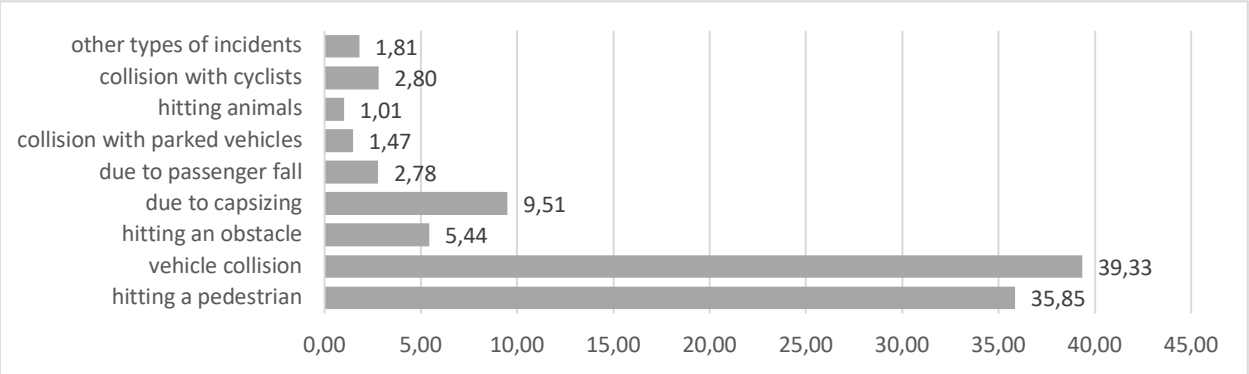


Figure 14 - Структура видов ДТП за 2020 год, %

54 Statistics for 2020 show that 9% of children, 75% of people of working age and 15% of people of retirement age die in road accidents. Injuries are 17% of children, 75% of people of working age and 8% of people of retirement age. At the same time, according to gender, 73% of men and 27% of women die in road accidents, 54% of men and 46% of women are injured.

B. Traffic violations in Kazakhstan

55 Based on the data of legal statistics of the General Prosecutor's Office of Kazakhstan for 2017-2021, 21.3 million administrative offenses of traffic rules were registered.
56 *Driving under the influence of alcohol.* In general, 132.9 thousand offenses were registered in Kazakhstan for driving under the influence of alcohol or drugs.

Table 6 - Dynamics of traffic violations in Kazakhstan

Name of the offense	Proportion of administrative offenses, ths.					
	2017	*2018*	*2019*	*2020*	*2021*	*Total*
Total violations of traffic rules in the Republic of Kazakhstan	**2 304.1**	**3 204.4**	**4 088.1**	**5 360.5**	**6 315.7**	**21 272.7**
The use of the telephone by driver when driving a vehicle	222.5	181.3	127.4	82.0	83.7	696.8
Exceeding the set speed	344.0	916.9	1 253.9	2 063.0	2 502.6	7 080.3
Failure to comply with the requirements for the use of seat belts or helmets	362.7	284.1	220.1	221.8	286.4	1 375.0
Violation of the rules for crossing intersections	11.4	38.3	103.0	128.8	170.8	452.2
Violation of the rules of maneuvering	125.8	116.5	108.4	67.3	91.1	509.0
Violation of oncoming passing or overtaking	7.3	7.9	10.9	11.0	21.6	58.7
Violation of the rules for stopping or parking vehicles	66.3	145.2	321.0	188.0	304.4	1 024.9
Driving through a traffic light	24.1	24.8	33.2	43.2	60.9	186.2
Failure to give priority to pedestrians	44.3	42.2	34.1	31.3	41.2	193.0
Failure to comply with the requirements prescribed by road signs or markings	456.8	713.4	1 076.2	1 618.5	1 788.1	5 653.0
Violation of the rules for using external lighting devices and sound signals	143.8	245.7	249.3	264.5	317.2	1 220.5
Driving a vehicle by a driver under the influence of alcohol	30.8	28.3	28.9	21.4	23.5	132.9
Violations resulting in harm to human health. damage to vehicles or other property	71.7	75.5	98.9	83.5	115.2	444.7
Failure to perform duties due to an accident	9.0	11.9	22.5	18.6	23.2	85.2
Driving a vehicle by an undocumented person	90.0	79.4	71.5	190.4	76.3	507.6
Creation of obstacles for the movement of vehicles	14.8	7.2	19.7	23.6	32.9	98.2
Violation of traffic rules by pedestrians	155.0	179.4	194.4	200.3	266.5	995.7
Other violations	114.7	95.9	98.8	86.9	88.8	485.2

57 *Over speed.* 7.1 million speed violations were registered, which is 33% of all administrative violations of traffic rules in the Republic of Kazakhstan.
58 *Use of security tools.* 1 375.0 thousand facts of non-use of seat belts, helmets and child car seats were registered, which is 6.5% of all traffic violations in the Republic of Kazakhstan.
59 *Use of cell phones while driving.* According to legal statistics, 696.8 thousand offenses were registered for the use of cell phones while driving, which is 3.3% of all violations.

60 *Driving in a fatigued state.* In general, 27.3 thousand cases were registered for violations of the regime of work and rest of drivers in the republic, which is 0.13% of all violations of traffic rules in the Republic of Kazakhstan. At the same time, an increase in the number of violations of the regime of work and rest by drivers by 6.6 times over this period was recorded from 1.4 to 9.2 thousand facts in relation to drivers of trucks and buses.

61 *Unsafe behavior of pedestrians.* In general, 995.6 thousand offenses were registered in Kazakhstan for violation of the rules of pedestrian traffic, which is 4.7% of all violations.

62 In the context of the project site, the RSA needs to pay special attention to 1) over speeding and 2) unsafe behavior of pedestrians. That is, taking into account the function of the road as the Main Street, to create conditions for vulnerable road users.

C. Calculation of economic losses from road accidents in Kazakhstan

63 In general, the calculation of economic losses from road accidents is a basic technical and economic indicator of the socio-economic efficiency of infrastructure projects. In Kazakhstan, there are 2 tools for calculating economic losses regulated by departmental regulatory and technical documents:

- R RK 218-121-2014 "Methodological recommendations for assessing economic losses from traffic accidents on roads in the Republic of Kazakhstan", and
- R RK 218-186-2022 "Recommendations on the Rules for Using the System for Assessing the Safety of Road Infrastructure with iRAP Tools".

Methodologically, these documents present different approaches, R RK 218-121 takes into account the specifics of Kazakhstan's national statistics, while R RK 218-186 uses a global approach based on accounting for GDP per capita.

64 To compare these approaches, we present the statistics of road accidents for 2015–2021. In general, during the analyzed period, 15.2 thousand people died, 141.5 thousand were injured and 70.8 thousand people were hospitalized.

Table 7 – Dynamics of road accidents in Kazakhstan for 2015–2021, pcs

Accident indicators	Total for 2015–21	2015	2016	2017	2018	2019	2020	2021	2022
Dead	15 239	2 453	2 390	2 086	2 096	1 947	1 997	2 270	14 592
Injured	141 505	24 055	23 389	22 256	20 445	15 420	17 844	18 096	2 396
Hospitalized	70 855	14 442	10 716	10 161	9 819	9 818	7 787	8 112	18 309

65 Based on the results of modeling the Kazakhstan methodology, the total amount of economic losses from road accidents amounted to 3.6 trillion tenge. At the same time, the calculation according to the iRAP methodology estimated similar losses in the amount of 7.3 trillion tenge, which is more than 2 times higher than the national calculations. A significant difference can be explained by linking R RK 218-121-2014 to the indicators of the average monthly wage, which more fully assesses the volume of production losses of the national economy, and the total volume in the share is 72%. It should also be noted that the difference in 2015 was 58%, and in 2021 it decreased to 36%.

Table 8 – Dynamics of economic losses from road accidents according to R RK 218-121-2014, mln tg

Types of losses from road accidents	Total for 2015–21	2015	2016	2017	2018	2019	2020	2021
Medical expenses	9 748	1 606	1 564	1 418	1 369	1 168	1 257	1 365
Production losses	2 650 905	296 670	327 724	303 414	327 124	357 222	444 612	594 140
Human losses	787 112	89 033	97 949	91 014	97 865	106 071	131 235	173 945
Material damage	91 143	15 139	14 405	13 640	12 640	13 315	10 832	11 172
Administrative expenses	129 640	13 294	14 297	14 387	21 332	22 592	21 568	22 170
Total economic losses	**3 668 548**	**415 743**	**455 938**	**423 873**	**460 330**	**500 368**	**609 504**	**802 792**

Table 9 – Dynamics of economic losses from road accidents according to the iRAP methodology, mln tg

Indicators	Total for 2015–21	2015	2016	2017	2018	2019	2020	2021
GDP per capita, mln tg		2.31	2.62	2.99	3.36	3.73	3.61	4.13
Life Cost Multiplier		70	70	70	70	70	70	70
Value of 1 life according to iRAP, mln tg		161.96	183.50	209.64	235.24	261.24	252.43	289.22
Multiplier value of 1 serious injury		0.25	0.25	0.25	0.25	0.25	0.25	0.25
Cost of a serious iRAP injury, mln tg		40.49	45.87	52.41	58.81	65.31	63.11	72.31
Losses from the dead, mln tg	3 435 503	397 298	438 564	437 312	493 062	508 628	504 107	656 533
Losses from serious injuries, mln tg	3 905 530	584 771	491 595	532 541	577 454	641 205	491 422	586 541
Total economic losses	**7 341 033**	**982 069**	**930 159**	**969 853**	**1 070 515**	**1 149 833**	**995 530**	**1 243 074**

Table 10 – Comparison of economic losses from road accidents of the methodology, bln tg.

Calculation method	Total for 2015–21	2015	2016	2017	2018	2019	2020	2021
The Republic of Kazakhstan	3 668.5	415.7	455.9	423.9	460.3	500.4	609.5	802.8
iRAP Methodology	7 341.0	982.1	930.2	969.9	1 070.5	1 149.8	995.5	1 243.1
Difference in numerical value	-3 672.5	-566.3	-474.2	-546.0	-610.2	-649.5	-386.0	-440.3
Difference in %	-50.03	-57.67	-50.98	-56.30	-57.00	-56.48	-38.78	-35.42

66 Thus, the applied methodology in iRAP for road safety audit of the project in a general sense corresponds to the general principles of accounting for economic losses, taking into account the basic deviation of 35% from the Kazakhstani methodology.

D. Description of the road safety situation at the project site

67 Considering the A-27 road along the Aktobe-Kandyagash section, in 2015–2022, 220 accidents were committed on this section, in which 91 people died and 405 were injured. That is, very dangerous indicators with an average annual number of 28 road accidents with 11 dead and 51 injured, and the severity of road accidents per 1 km is 0.32 road accidents, 0.13 dead and 0.6 injured.

Table 11 - Number of accidents on the Aktobe-Kandyagash section for 2015–2022

Year	Amount of accidents	Dead	Injured
2015	31	15	67
2016	31	13	54
2017	19	8	29
2018	24	15	43
2019	27	11	56
2020	20	8	31
2021	30	5	53
2022	38	16	72
Total for 2015-2022	**220**	**91**	**405**
The severity of road accidents per 1 km per year	**0.32**	**0.13**	**0.60**
Average over 8 years	**28**	**11**	**51**

68 For the section of passage through the settlement of Bestamak, in 2015–2022, 19 accidents were committed, in which 9 people died and 38 were injured:

- 2015: 4 road accidents, 7 people died; 8 people injured;
- 2016: 1 road accident, 0 people died; 1 people injured;
- 2017: 0 road accidents, 0 people died; 0 people injured;
- 2018: 1 road accident, 0 people died; 1 people injured;
- 2019: 3 road accidents, 1 people died; 7 people injured;

- 2020: 5 road accidents, 0 people died; 6 people injured;
- 2021: 4 road accidents, 1 people died; 14 people injured;
- 2022: 1 road accident, 0 people died; 1 people injured.

69 At the same time, the severity of accidents per 1 km of the project section was 0.59 accidents per year, 0.28 deaths and 1.19 injured per year, which is 2 times higher than for the entire Aktobe-Kandyagash section. Objectively, the current situation indicates the need for a systematic approach to resolve the problem, some of which will be solved by transferring the road to the I technical category with 4-lane traffic with separate flows.

70 The project site is dominated by collision (58%), rollover (21%) and pedestrian (16%) accidents, accounting for 100% of deaths and 97% of injuries (see Table 12).

Table 12 - Number of types of accidents at the project site for 2015–2022

No.	Accidetent type	Accident qty		Died		Injured	
		un.	%	prs	%	per	%
1	Collision	11	58	7	78	27	71
2	Rollover	4	21	2	22	7	18
3	Pedestrian collision	3	16		0	3	8
4	Others	1	5		0	1	3
	Total	**19**	**100**	9	**100**	**38**	**100**

71 Considering the causes of accidents, the key ones are speeding (21%), driving into the oncoming lane and maneuvering (37%), violations of pedestrian crossings (11%). For these reasons, 10% of people died and 77% of people were injured. (see Table 13).

Table 13 - Causes of accidents at the project site in 2015–2022

No.	Accidetent type	Accident qty		Died		Injured	
		un.	%	prs	%	чел	%
1	Over speed	4	21	6	67	12	32
2	Violation of maneuvering	4	21	3	33	12	32
3	other types of violations	5	26			8	21
4	Driving into oncoming lane	3	16			3	8
5	Failure to keep distance	1	5			1	3
6	Passage of pedestrian crossings	2	11			2	5
	Total	**19**	**100**	9	**100**	**38**	**100**

72 Thus, according to Table 2 of CAREC Manual No. 1 Road Safety Audit, the site is characterized as “probable – one or more times a year” according to the assessment of the frequency of accidents, and as “severe – death and (or) serious injuries are likely" according to the severity assessment. Thus, the severity of the road safety problem is classified as "**Unacceptable**", which must be corrected regardless of cost.

Table 14 - Determining the Severity of a Security Issue

Risk		Частота возможных ДТП			
		Common	Probable	Occasional	Unlikely
Severity of the accident	Catastrophic	Unallowable	Unallowable	Unallowable	High
	Serious	Unallowable	**Unallowable**	High	Medium
	Moderate	Unallowable	High	Medium	Low
	Limited	High	Medium	Low	Low

Table 15 - Setting a course of action

Risk	Treatment of problems solving
Unallowable	The problem must be fixed no matter the cost.
High	The problem must be fixed even at high cost
Medium	The problem should be fixed if the cost of fixing is moderate but not high.
Low	Security issue should be fixed if fix costs are low

73 For the project site, based on the results of modeling the Kazakhstan methodology, the total amount of economic losses for 2015-2022 from road accidents amounted to 3.4 billion tenge or 425 million tenge annually. At the same time, the calculation according to the iRAP methodology estimated similar losses in the amount of 5.7 billion tenge or 713 million tenge annually.

Table 16 – Comparison of economic losses from road accidents of the methodology for 2015-22, mln tg.

Estimation method	Accident with dead	Accident with injuries	Toatl	Total in mln $
The Republic of Kazakhstan	2 915	490	3 405	7.5
iRAP Methodology	2 811	2 968	5 779	12.8

74 Thus, if measures are not taken for 20 years without reconstruction of the Bestamak section, it is expected that in total 118 people will suffer at the project site, and the total economic losses are estimated at 14.2 billion tenge (in 2022 prices) or 31.6 million $.

75 Section summary: During the safety audit process, attention should be paid to (i) the organization of pedestrian crossings, the organization of measures to reduce the risks of collision (ii) the regulation of speed limits and (iii) the provision of safe overtaking zones and intersections.

VI. RESULTS OF THE PRELIMINARY STAGE OF RSA

A. Collection of field data on the conditions of the project area

76 The consultant carried out a technical inspection of the project site with fixation of the inspection on the Mapillary platform. Based on the inspection results, it was found that at the moment the section of the Aktobe-Kandyagash road along the Bestamak village is in extremely poor condition. Despite the fact that this road has the status of international importance and is part of the connecting road of CAREC corridors 1 and 6. Based on a preliminary analysis of the indicators of the project section, more than 22 key points have been identified that need to be given special attention in the road safety audit.

77 The lack of pavement contributes to a large number of dust particles in the air, which makes it difficult and blocks the visibility of passing and oncoming vehicles. The number of arbitrary exits from the main road is calculated in tens, for each allotted land plot. Warning signs are posted throughout the project area.

Figure 15 - Project site inspection

78 *Traffic intensity.* According to visual inspection, the intensity in the project area is predominantly high. The main cargo flow is made up of trucks and rout buses connecting Atyrau - Aktobe, Shalkar - Aktobe with transit through Kandyagash and Bestamak. Along the project section of the road, there is a service station, a gas station, a pharmacy, shops and cafes, the main visitors of which are drivers and passengers. The condition of the pavement is in an extremely unsatisfactory condition and does not have a solid and even coating, which leads to forced maneuvers of vehicles and at the same time is the reason for the need for constant dedusting of the roadway.

B. Work carried out within iRAP for Design

79 *Initial data*. Supporting data is needed to ensure that the results of the iRAP Star Rating project reflect local conditions, practices and experiences.

The sources of this information are represented mainly by the following types of data:

- project documentation data;
- road attribute coding data;
- external data (described in this section):
  - demographic and economic data;
  - data on traffic intensity;
  - percentage of motorcycles;
  - flow of pedestrians and cyclists;
  - working speed;
  - mortality data;
  - cost of countermeasures.

80 *Demographic and economic data.* Demographic and economic data were obtained from various sources.

Table 17 – Demographic and economic data

Category	Value	Source/ Comments
Year of assessment	2023	This year
Driving direction	Right-hand	Public law
Analysis period [years]	20	Default value
GDP per capita [tenge]	4 748 290	World Economic Outlook database: April 2021
Percentage [%]	14.5	Kazakhstan National Bank
Minimum attractive rate of return	0.15	Kazakhstan National Bank
Internal rate of return	0.15	Calculated by VIDA
Life Value Multiplier	70	Default value
The Life Value [tenge]	332 380 300	Calculated by VIDA
Serious Injury Cost Multiplier	0.25	Default value
The serious injury value [tenge]	83 095 075	Calculated by VIDA
Ratio of serious injuries to fatalities	4.45	Calculated on the basis of accident data on A-27 from 2015 to 2022 "Aktobe - Kandyagash"

81 *Traffic intensity data.* Data on traffic intensity and composition of the traffic flow are taken on the basis of design surveys. At the same time, the share of motorcycles is 1-5% of the total number of vehicles.

Сведения об интенсивности и составе транспортного потока по дорогам республиканского значения
на А-27 "Актобе-Атырау-граница РФ (на Астрахань) участок км 11-52

	Год	Начало, конец участка	Шифр учетного пункта, вид учета	Легковые и микроавтобусы	Автобусы		Оценочные грузовики					Автопоезда с прицепом, количество осей				Седельные тягачи с полуприцепом, количество осей					Тракторы		Всего	Прирост интенсивности
					средние	тяж	2-х осные, грузоподъемностью до 2 тн	2-5 тн	5-10тн	3-х и 4-х осные, грузоподъемностью 5-10 тн	10-12 тн	2-х осн (11-11)	2-х осн (11-12)	3-х осн (12-11)	3-х осн (12-12)	2-х осн (111)	2-х осн (112)	2-х осн (113)	3-х осн (122)	3-х осн (123)	легк прицеп	тяжёл прицеп		
По видам транспорта	2011	11	A-27-K1	5878	24	55	38	101	67	83	94	85	75	56	50	61	57	70	80	70	9	4	7557	
		43	A-27-K2	5564	41	21	40	99	116	89	79	36	15	21	22	54	40	64	74	59	9	3	6637	
По видам транспорта	2012	11	A-27-K1	6094	15	12	54	254	145	178	201	98	85	74	65	61	58	60	90	80	10	8	7868	1,087
		43	A-27-K2	5802	12	4	50	180	145	199	148	72	35	49	44	54	50	75	84	82	9	5	7090	
По видам транспорта	2013	11	A-27-K1	4265	75	0	0	0	233	398	349			225	284				218	333			6365	1,204
		43	A-27-K2	6036	44	0	0	0	350	44	242					3	3	5	5	10			6742	
По видам транспорта	2014	11	A-27-K1	5635	99	0	0	0	308	526	462			297	349				288	447			8411,0	1,003
		43	A-27-K2	6017	44	0	0	0	349	44	241					3	3	5	5	10			6721,0	
По видам транспорта	2015	11	A-27-K1	6616	119	0	0	0	372	637	558	0	0	369	422	0	0	0	348	540			10172	1,209
		43	A-27-K2	6098	30	50	0	0	310	90	424	0	0	0	8	9	10	54	54	54			7882	
																							Средний прирост интенсивности	1,12

Заместитель директора
АОФ АО "НК "КазАвтоЖол" Муканбеталиев А.Р.

Составил: Уразбеков С.М.

Среднесуточная интенсивность движения по годам (авт/сутки)

Актобе-Атырау-граница РФ (на Астрахань) Актобе - Алга

Годы	Легко-вые	Автобусы		Одиночные грузовики					Автопоезда с прицепом, количество осей				Седельные тягачи с полуприцепом, количество осей					Всего
		лег.	тяж	2-х осные, грузоподъемностью			3-х и 4-х осные, грузоподъемностью		2-х осн. (11-11)	2-х осн. (11-12)	3-х осн. (12-11)	3-х осн. (12-12)	2-х осн. (111)	2-х осн. (112)	2-х осн. (113)	3-х осн. (122)	3-х осн. (123)	
				До 2 тн.	До 5 тн.	5-10 тн.	5-10 тн.	10-12 тн.										
2015	8723	33	55	0	0	1033	393	956	0	0	24	80	28	15	84	84	210	11726
2016	9159	35	58	0	0	1084	413	1004	0	0	25	92	29	16	88	88	221	12312
2017	9617	36	61	0	0	1138	433	1054	0	0	26	97	31	17	93	93	232	12927
2018	10098	38	64	0	0	1195	455	1107	0	0	28	102	32	17	97	97	243	13574
2019	10603	40	67	0	0	1255	478	1162	0	0	29	107	34	18	102	102	255	14252
2020	11133	42	70	0	0	1318	502	1220	0	0	31	112	36	19	107	107	268	14965
2021	11690	44	74	0	0	1384	527	1281	0	0	32	118	38	20	113	113	281	15713
2022	12274	46	77	0	0	1453	553	1345	0	0	34	124	39	21	118	118	295	16499
2023	12888	49	81	0	0	1525	581	1412	0	0	36	130	41	22	124	124	310	17324
2024	13532	51	85	0	0	1602	610	1483	0	0	37	137	43	23	130	130	326	18190
2025	14209	54	90	0	0	1682	640	1557	0	0	39	143	46	24	137	137	342	19100
2026	14919	56	94	0	0	1766	672	1635	0	0	41	151	48	26	144	144	359	20055
2027	15665	59	99	0	0	1854	706	1717	0	0	43	158	50	27	151	151	377	21057
2028	16449	62	104	0	0	1947	741	1803	0	0	45	166	53	28	158	158	396	22110
2029	17271	65	109	0	0	2044	778	1893	0	0	48	174	55	30	166	166	416	23216
2030	18134	69	114	0	0	2146	817	1987	0	0	50	183	58	31	175	175	437	24376
2031	19041	72	120	0	0	2254	858	2087	0	0	52	192	61	33	183	183	458	25595
2032	19993	76	126	0	0	2367	901	2191	0	0	55	202	64	34	193	193	481	26875
2033	20993	79	132	0	0	2485	946	2301	0	0	58	212	67	36	202	202	505	28219
2034	22043	83	139	0	0	2609	993	2416	0	0	61	222	71	38	212	212	531	29630
2035	23145	88	146	0	0	2740	1043	2537	0	0	64	233	74	40	223	223	557	31111
2036	24302	92	153	0	0	2877	1095	2663	0	0	67	245	78	42	234	234	585	32667
коэф. Приведения		0,650	0,230	0,000	0,06	0,32	0,17	2,72	0,89	0,89	3,30	3,30	0,61	2,55	4,73	3,90	6,08	
Nпр		7,00	33,56	0,00	0,00	876,65	177,27	6890,42	0,00	0,00	210,14	770,52	45,32	101,49	1054,21	869,22	3387,73	14432,53

Figure 16 – Approved design traffic intensity Aktobe-Alga

82 *The flow of pedestrians and cyclists.* To assess the safety of pedestrians and cyclists, data on the amount of pedestrians and cyclists is needed. The following 4 values are required for each 100m section in the ViDA download file:

- pedestrian traffic at rush hour across the road
- pedestrian traffic at rush hour along the driver's side of the road
- pedestrian traffic at rush hour along the passenger side of the road
- cyclist traffic at rush hour

83 Since data on the traffic of pedestrians and cyclists is not available, a tool based on land use on both sides of the road is applied. The default values in the matrices have been chosen. Part of the road, due to the passage of the road outside the city, in the absence of settlements, we take the flow of pedestrians and cyclists equal to "1". As part of the survey at the field inspection, the following data on pedestrians were generated, presented in the table below.

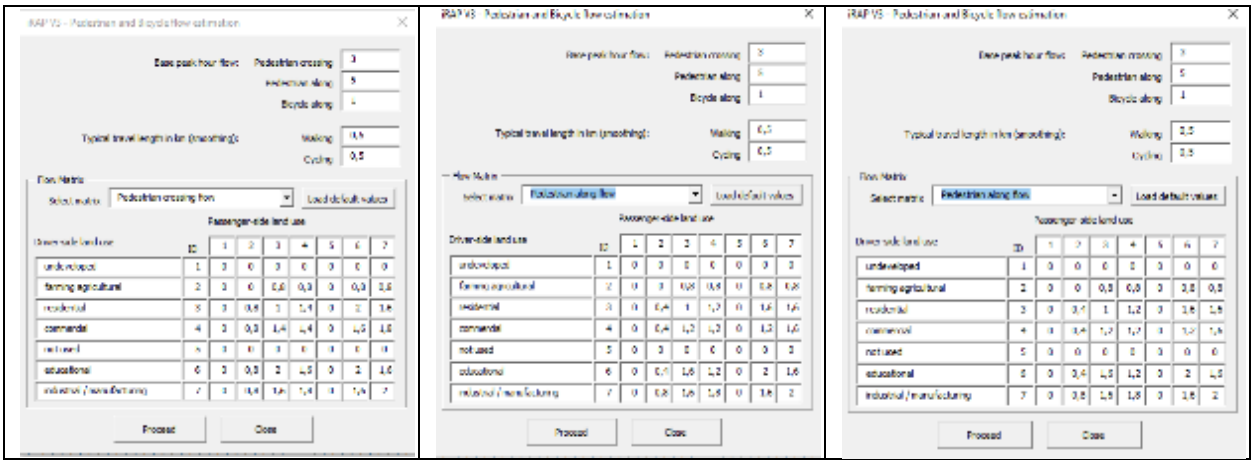


Figure 17 – iRAP preprocessor settings for pedestrian counting

Table 18 – Pedestrian and traffic data for iRAP

Road attribute matrix	Current road
Traffic density (AADT)	**AADT**
15 000 – 20 000	3.1
% of motorcyclists	**km**
1% - 5%	3.1
Pedestrians in rush hour across the road	**Pedestrians**
0	2.6

6 to 25	0.1
26 to 50	0.1
51 to 100	0.3
Pedestrian traffic during rush hour along the road on the driver's side	**Pedestrians**
0	1.1
1 to 5	1.1
6 to 25	0.4
26 to 50	0.3
51 to 100	0.2
Pedestrian traffic during rush hour along the road on the passenger's side	**Pedestrians**
0	1.1
1 to 5	1.1
6 to 25	0.4
26 to 50	0.3
51 to 100	0.2
Cyclist traffic during rush hour	**Cyclists**
Absent	1.5
1 to 5	1.6

84 *Operating (actual) speed.* The operating speed values have been taken as the estimated design road speed from the table below. These calculation results are used as the average speed and 85th percentile for subsequent applying. The 85th percentile speed means that 85% of cars do not exceed this speed.

Table 19 – iRAP speed data

Road attribute matrix	Current road	Project	With recomendation
The set speed	**km**	**km**	**km**
40km/h	2.3		
50km/h			1.9
60km/h	0.4	2.3	0.6
80km/h	0.4	0.4	0.4
90km/h			
100km/h		0.4	0.2
Operating speed (85th percentile)	**km**	**km**	**km**
50km/h	2.3		1.9
60km/h			
70km/h	0.4	2.3	0.6
90km/h			0.4
100km/h	0.4	0.4	0.2
110km/h		0.4	
Operating speed (value)	**km**	**km**	**km**
50km/h			1.9
60km/h	2.3	2.3	0.6
80km/h	0.4	0.4	0.4
100km/h	0.4	0.4	0.2

85 *Mortality data.* Data on road accidents for the period 2015–2020 were received from the Karaganda branch of “NC “KazAvtoZhol” JSC.

Table 20 – Data on traffic accidents on the A-27

Accident address, km	Date, month	Accident type	Accident reason	Accident Factor Calibration	Number of accidents	Died	Injured
19	05.01.2015	Collision	Over speed	Head-on collision with loss of control	1	5	5
19	20.02.2015	Collision	Departure to the opposite lane	Head-on collision with loss of control	1	0	1
17	03.08.2015	Rollover	Lost control	Other	1	2	1
16	19.08.2015	Collision	Departure to the opposite lane	Head-on collision with loss of control	1	0	1
17	29.10.2016	Collision	Departure to the opposite lane	Head-on collision with loss of control	1	0	1
18	28.08.2018	Rollover	Gross traffic violations	Other	1	0	1
17	03.03.2019	Pedestrian collision	Violation of pedestrian crossings	Pedestrians	1		1
18	13.05.2019	Collision	Violation of the rules of overtaking	Head-on collision with loss of control	1	1	5
16	19.11.2019	Rollover	Over speed	Other	1	0	1
18	24.01.2020	Collision	Failure to keep distance	Other	1		1
16	11.08.2020	Pedestrian collision	Other	Pedestrians	1		1
18	12.11.2020	Hitting a vehicle	Driving a vehicle while intoxicated	Other	1		1
18	19.12.2020	Collision	Over speed	Head-on collision with loss of control	1	0	2
18	29.12.2020	Collision	Failure to comply with traffic signs	Head-on collision with loss of control	1		1
16	03.01.2021	Rollover	Other	Collision with roadside objects	1		4
18	25.01.2021	Collision	Over speed	Other	1	1	4
15	13.08.2021	Collision	Violation of the rules of overtaking	Head-on collision with loss of control	1		5
17	16.10.2021	Pedestrian collision	Other traffic violations by pedestrians	Pedestrians	1		1
16	10.05.2022	Collision	Violation of the rules of overtaking	Other	1	0	1
				Total for 2015-2022	**19.00**	**9.00**	**38.00**
				Accident severity per 1 km (4 km)	**0.59**	**0.28**	**1.19**
				Average over 8 years	**2**	**1**	**5**

Also taken into account is the iRAP recommendation to include 1% of motorcyclists and 10% of pedestrians in the consequences of an accident. While cars accounted for 88%.

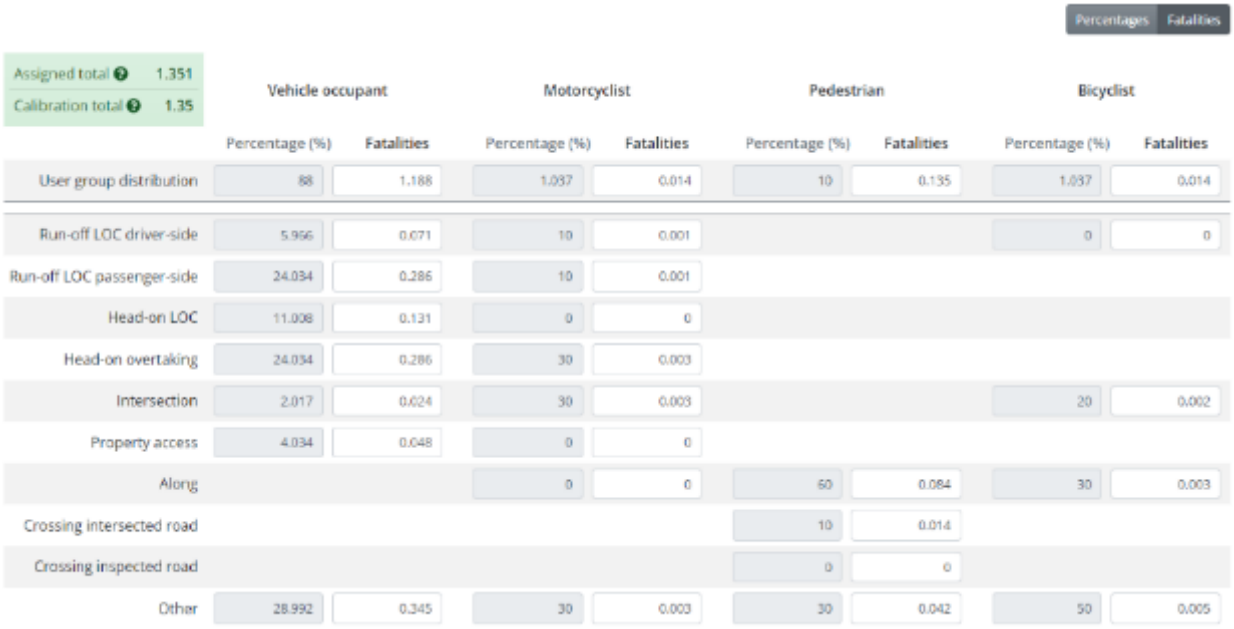


Figure 18 – Calibration of VIDA according to the consequences of an accident

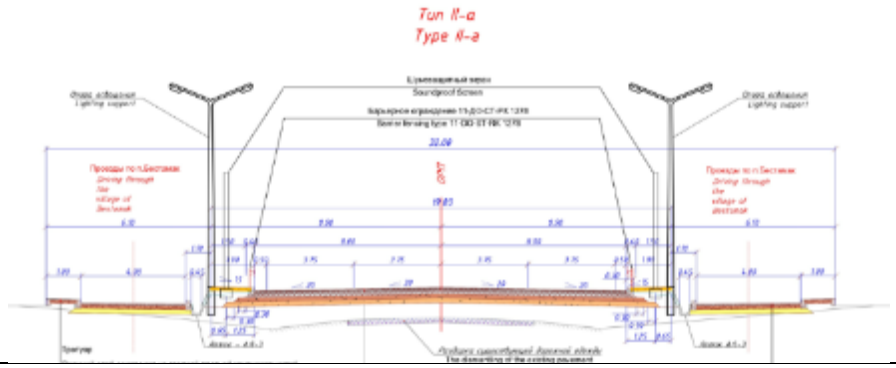
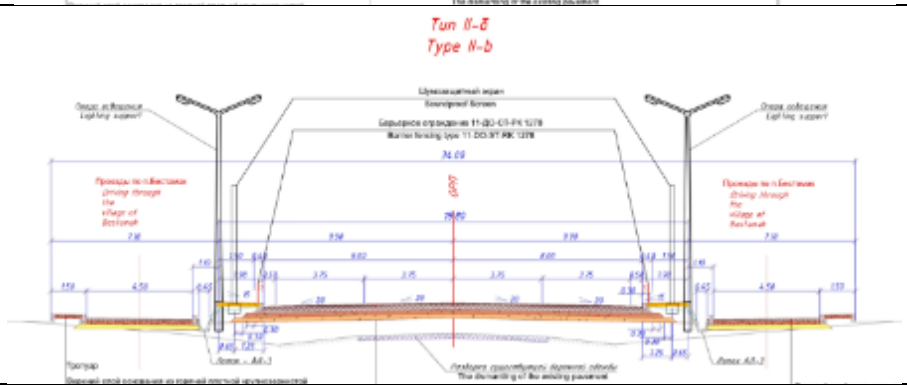
86 *Initial data for ViDA.* The mortality underreporting factor was calculated based on data collected in the WHO Global Report 2018. From the values of the reporting ratio and the estimated death rate in road accidents, result 1.2 was obtained. The annual mortality multiplier is set to 1. Road traffic accidents in ViDA are calibrated based on the WHO Global Report 2018. This data

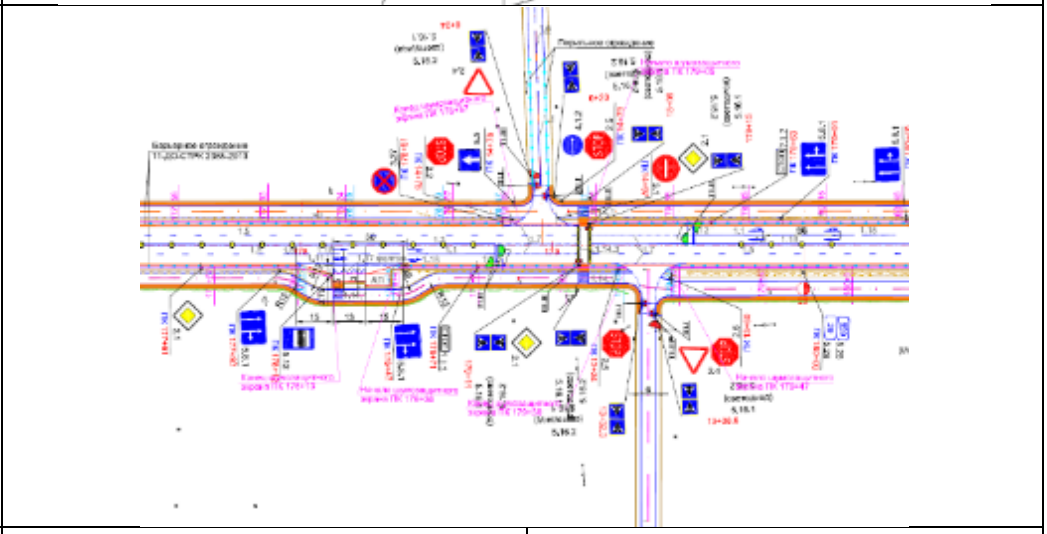
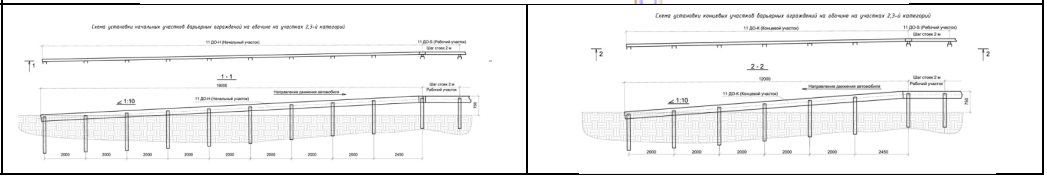
contains information on the distribution of fatalities among individual road users. Then automatic calibration was performed.

87 *Cost of countermeasures.* The cost of countermeasures was adopted by analogy with the EWRP / QCBS-2019 / EURISAP project “Implementation of the European Road Infrastructure Safety Assessment Program in the Republic of Kazakhstan: Report on the Star Rating and Investment Plan - 5000 km of Republican Roads” in 2023 prices.

88 *Project documentation.* Before coding, design documentation data was entered into VIDA.

Table 21 – Example of used design documentation for SR4D

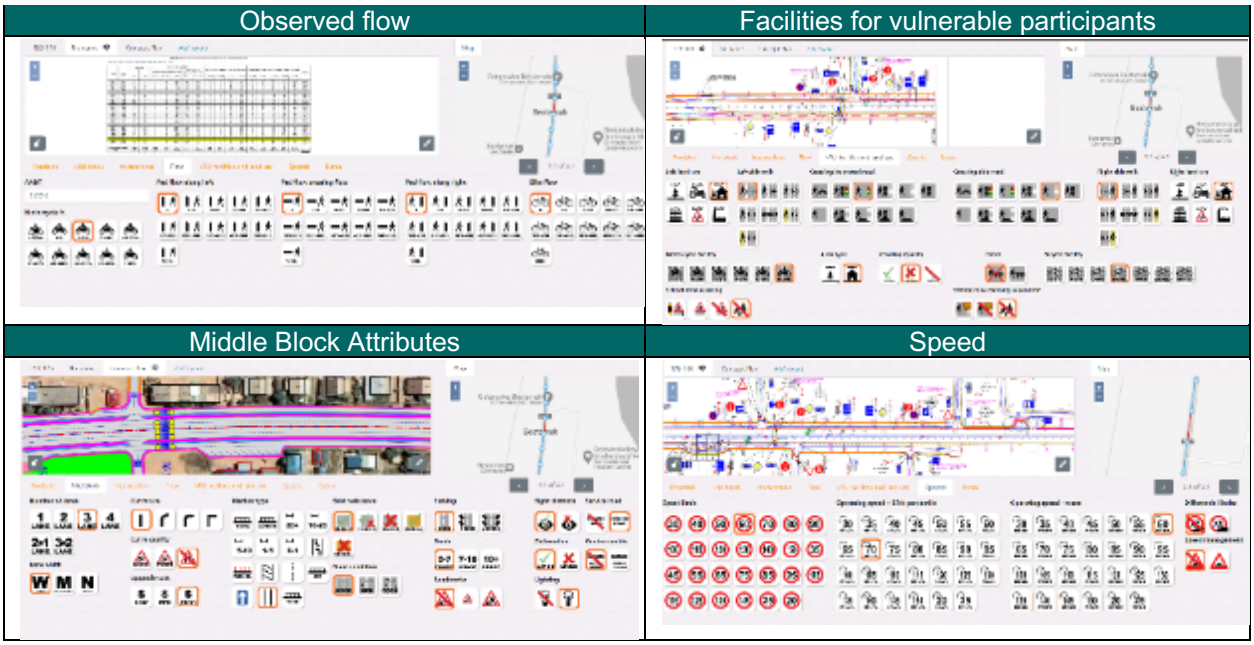
Map of the road axis in KML format every 100 m	
Concept plan	
Typical road profiles	 

	
Intersection maps	
Scheme of installation of metal road barriers	

89 *Road Attribute Coding.* Road attributes were coded in the SR4D module in Vida. All road attributes were transferred to SR4D for every 100 m. Each lot of the project section was coded separately.

Table 22 – An example of the encoding process in SR4D

Roadside attributes	Intersections
	



90 *Processes.* The boot file is a .csv data file that contains the description of the road by iRAP attributes. Encoding is done on 100m sections. Each 100m section is represented by one line in the data file. The "ViDA" interactive assessment tool (available at https://vida.iRAP.org/) was configured based on the validated data. After that the file was uploaded. Next, the road network was estimated automatically.

91 *Calibration of VIDA.* After that, ViDA had to be calibrated using the fatality data. ViDA estimated the expected death rates for each road section based on attribute coding. These rates were compared with crash data and a calibration factor was calculated as the ratio between crash data and ViDA mortality rates. This was done using the auto-calibration tool in ViDA.

VII. OVERALL RSA AND SR4D RESULTS

A. Results of Road Safety Audit

Speed rate.

92 *Description of design solutions*. According to the project, the speed limit through the settlement of Bestamak is set at 60 km/h and 4 speed control systems are provided.

93 *Description of problem*. According to paragraph 1 of Article 592 of the Code of Administrative Offenses, a fine is imposed when the established speed of the vehicle is exceeded by 10 to 20 km/h. Thus, this allows the driver to legally move through the settlement at a speed of 70 km/h, and taking into account the error of photo / video recording systems for speeding violations equal to 7 km/h, the permissible speed will be 77 km/h.

94 At a legal speed of 70 km/h, safety principles for vulnerable road users are violated. According to paragraph 19 of the CAREC Manual No. 4 "Pedestrian Safety", the probability of death for pedestrians: in a collision at 50 km/h will kill 55% of pedestrians from the impact. In our case, at this speed, the braking distance in dry conditions will be 57 meters and the impact of a pedestrian occurs at a speed of 46 km / h, which brings the probability of death to 85%.

Figure 19 - Probability of death of a pedestrian in a collision with a car

Figure 20 - Effect of speed in collisions with pedestrians

95 *Solution Description.* Given the high traffic intensity on the section of the road along the settlement of Bestamak, the consultant strongly recommends setting the maximum allowed speed at 50 km/h, which, if the speed limit is exceeded, will reduce the braking distance to 45 m and stop on time. Thus, significantly reduce the likelihood of a fatal outcome for a pedestrian, even not at a regulated pedestrian crossing or conditions when traffic lights and speedometers will not function.

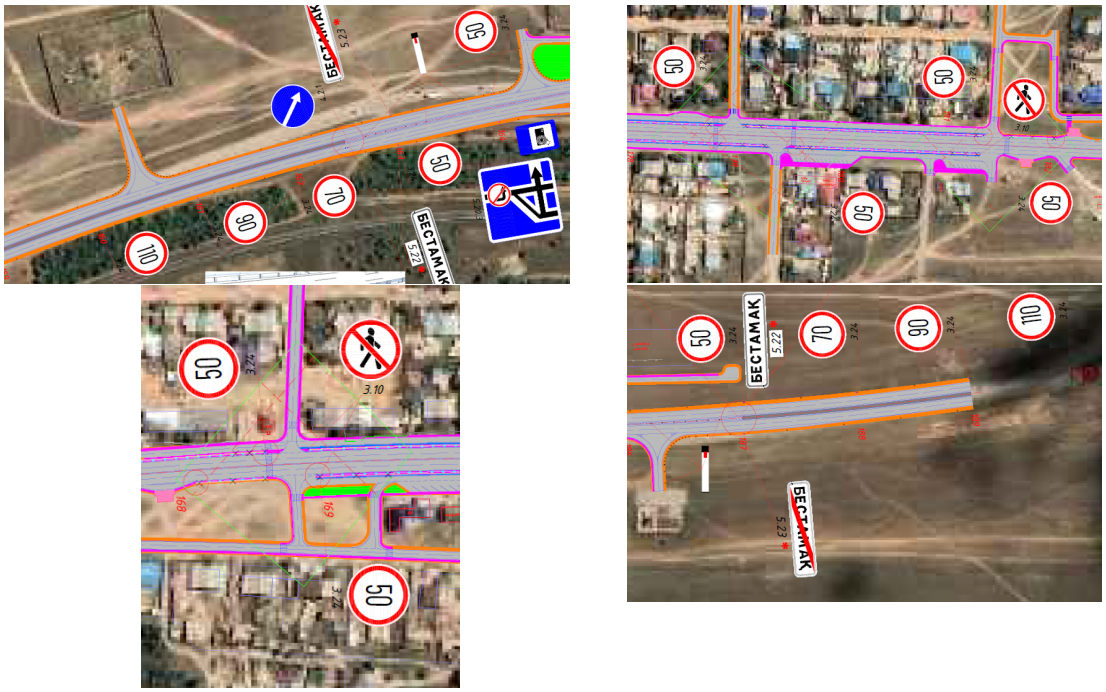


Figure 21 – Speed scheme

96 Based on preliminary negotiations with the Administrative Police Committee of the Ministry of Internal Affairs of the Republic of Kazakhstan, the proposal to reduce the speed limit on Magistralnaya Street from 60 to 50 km/h found preliminary support. In addition, it is imperative to establish a speed limit of 40 km/h on local roads..

97 *Assessing the impact on the star rating.* Changing the speed limit at pedestrian crossings, without taking into account other recommendations, improves the level of safety for all participants by 2 times. Thereby increase the star rating from 2 to 3 stars.

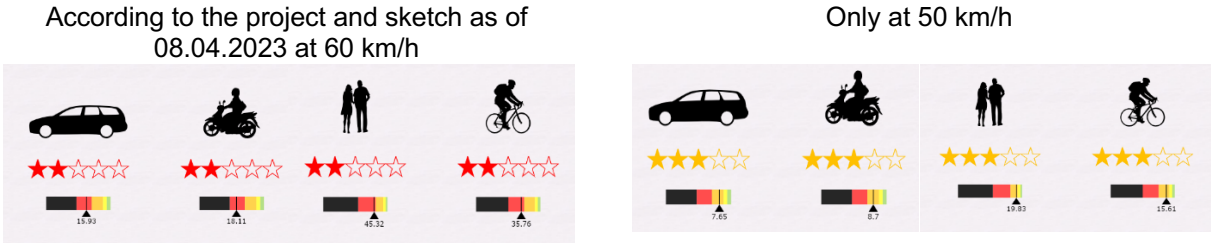


Figure 22 – Impact of speed reduction

Traffic and speed regulation.

98 Description of design solutions. According to the project, traffic lights are provided with sensor devices for calling a traffic signal at PK 168+80, PK 175+70, PK 179+10. In places where pedestrians cross the roadway, one combined time countdown device with an animated walking person is installed on cantilever supports and transport racks. Linear type speedometers - registering violations in speed and lanes. Traffic at the intersection is organized according to the principle of "straight and right" from all approaches.

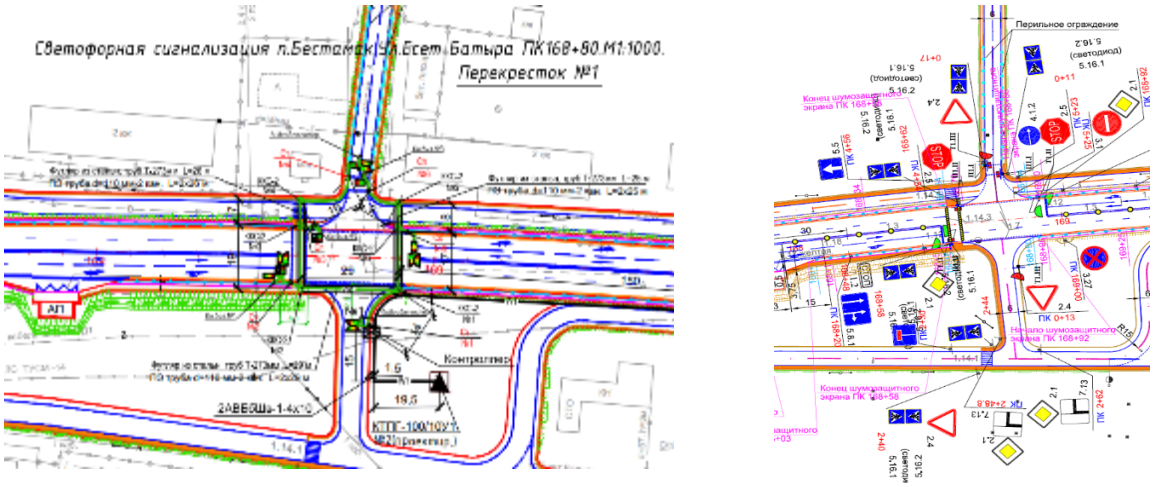


Figure 23 – Traffic lights organization scheme

99 *Description of the problem.* Traffic light facilities for those leaving the adjacent roads may be complicated by the limitation of the time of the "green signal" on the main road. At intersections, visibility is so complicated due to the presence of noise screens. A pedestrian crossing is provided only on one side, respectively, on the other side of the road there are no signs 3.10 "Pedestrian traffic is prohibited."

100 *Description of the solution.* In order to improve traffic management, the Consultant proposes to supplement the existing traffic signal facilities equipped with a motion sensor system (for the secondary road at intersections and junctions) and a traffic signal call button for pedestrians (see Annex G).

101 If the motion sensor detects the presence of a vehicle on a secondary road, namely at the junction and / or intersection, the traffic light will turn green only 30 seconds after its detection, which will reduce the risk of traffic jams moving along the main roadway.

102 In addition, it is proposed to equip traffic lights with the FRED (feu de ralentissement éducatif) system, which stands for “educational traffic light that reduces traffic speed” in French. There is a technical possibility to integrate the work of a traffic light with a system for detecting violations of the speed limit, in terms of switching the traffic light to red in case of exceeding the speed of 50 km/h. The FRED model forces speeding drivers to stop and reminds them of the speed limit.

103 Prevention of violations of traffic rules and strict compliance with them allows you to optimize the risk of traffic accidents. In Kazakhstan, the practice of using hardware and software systems "Sergek", "Megacam.Strazh" and others within the framework of the "Safe City" projects to automatically monitor compliance with traffic rules in automatic mode is widely used.

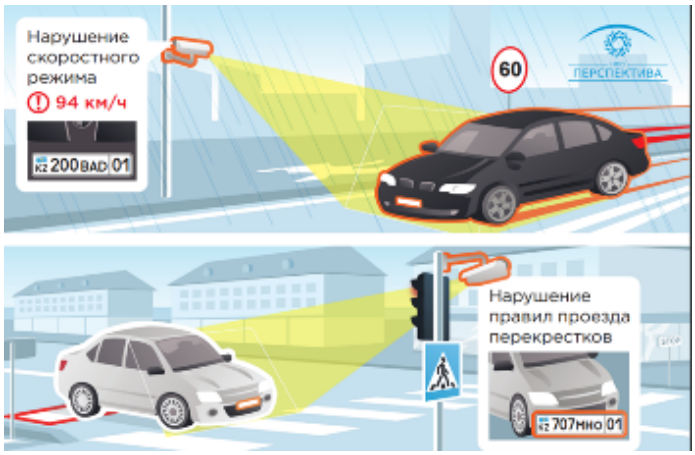
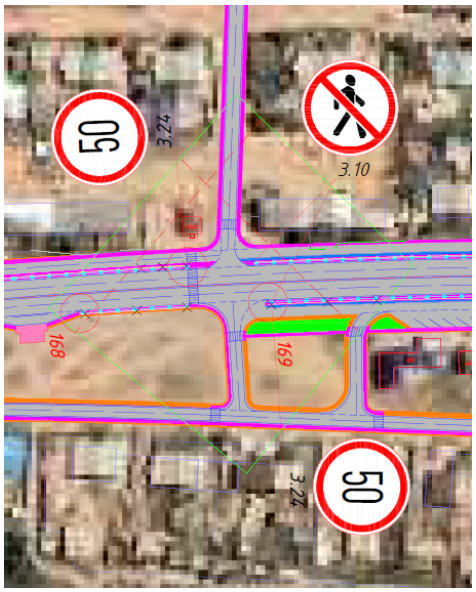


Figure 24 - An example of some functions of hardware and software systems

104 With regard to systems for fixing violations of the speed limit, it should be noted that the systems differ in linear systems for straight sections and cross-road for road intersections. Based on the function of the "Main Road" section, the automated software package "Linear Section" is suitable for the project.

105 In addition, the customer must take into account that in addition to capital costs for the installation of speedometers from 7 to 16 million tenge per 1 point, there are also operating costs for maintenance in the amount of up to 1 million tenge (see Appendix G).

106 It is also recommended that at 2 intersections PK 168+95 and PK 181+40 on both sides of the road it is recommended to provide for the installation of sign 3.10 “Pedestrian traffic is prohibited”.



PK 168+95

PK 181+40

Figure 25 – Places for installation of the sign 3.10 "Pedestrian traffic is prohibited"

107 *Assessing the impact on the star rating*. Changing the speed limit at pedestrian crossings, taking into account the recommendations on smart traffic lights, linear speedometers and signs, improves the level of safety for all participants by 3 times. Thereby increase the star rating from 2 to 4 stars for cars and pedestrians.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account proposals for traffic regulation

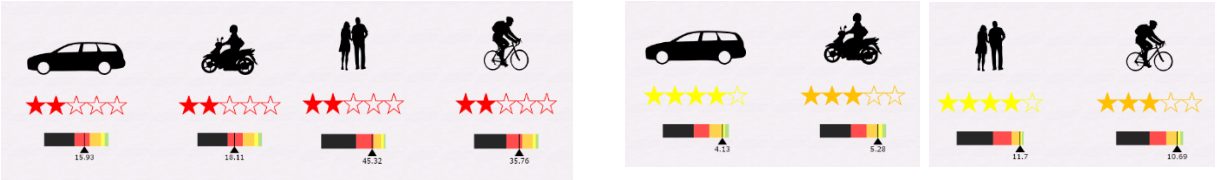


Figure 26 – Impact on the organization of traffic in the village of Bestamak

Traffic management on a secondary road.

108 *Description of design solutions*. The project provides for a main road and a local roadway with a pavement of 4.5 m wide with a total width of the site boundaries of 34.0 meters. Between the edges of the main road and the local roadway, elements occupying 3.0 m are provided. In order to reduce noise pollution of the adjacent territories, noise screens are provided, which are protected by a guardrails to the main road. Next, lighting poles, a drainage tray and a curb are arranged.

PK 169-172 section has constrained conditions, where the width of the section boundaries is 32.0 m, narrowed by reducing the width of the carriageway of the local passage from 4.5 to 4.0 m and the sidewalk from 1.5 to 1.0 m.

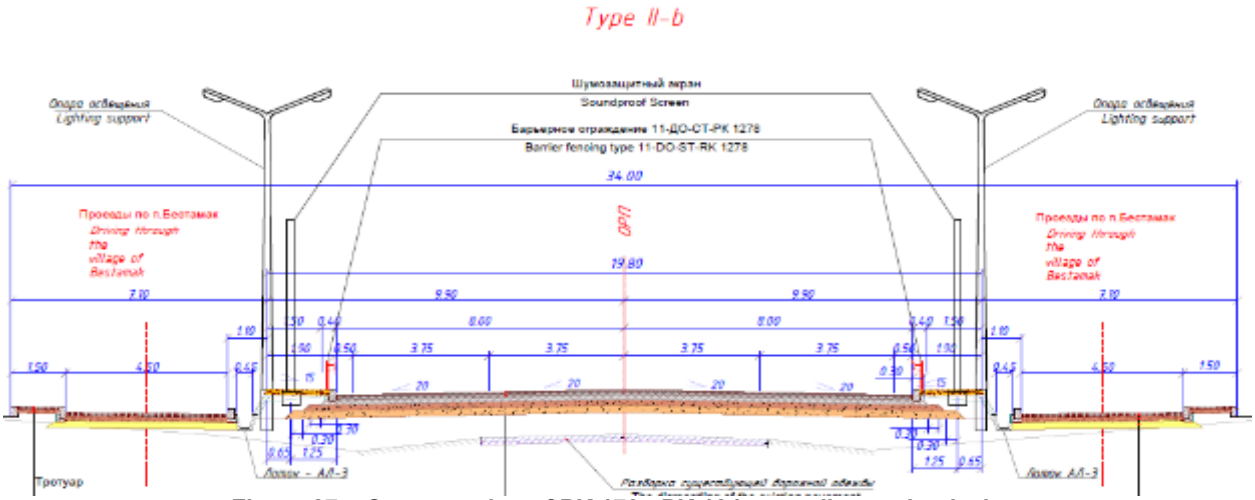


Figure 27 – Cross section of PK 173 - PK 184 according to the design

Figure 28 – Situational diagram for the cross section of PK 173 - PK 184 according to the project

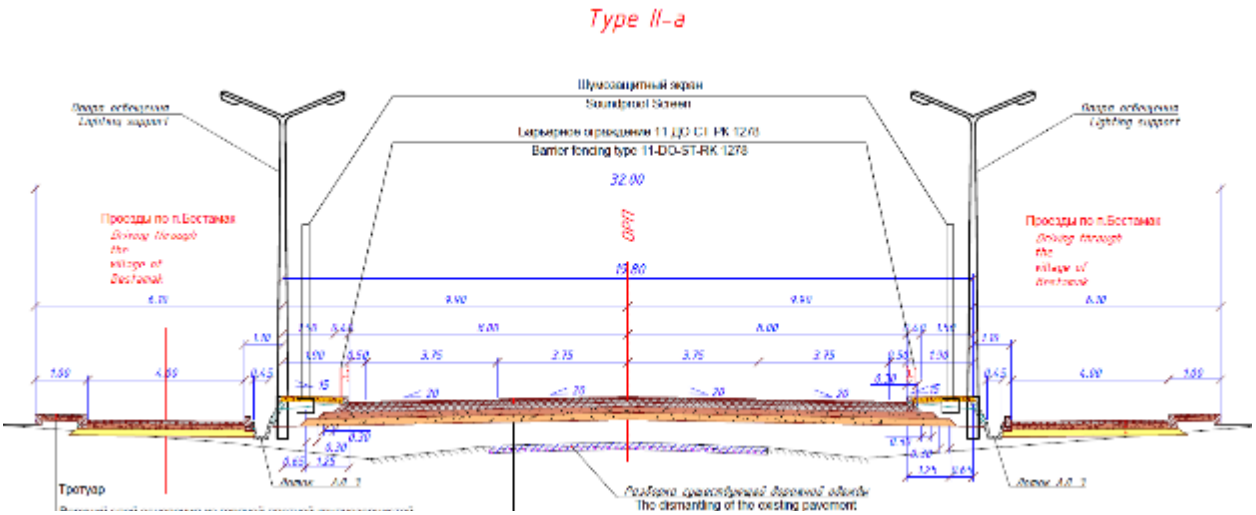


Figure 29 – Cross section of PK 164 - PK 173 according to the design

109 *Description of the problem*. The foreseen restrictions in constrained conditions can lead to certain complications, first of all, to the operating organization during the work on cleaning the snow mass in the winter. In addition, the presence in the settlement of Bestamak of a large number of cargo vehicles (tractors with trailers, dump trucks, etc.), as well as the likelihood of stopping a large transit vehicle, can lead to paralysis of local transport.

110 *Description of the solution.* To this end, the consultant recommends increasing the width of the pavement to 5.7 m in places where it is possible by changing the arrangement of guardrails, lighting poles, drainage tray and noise barrier.

The consultant presented several options for the implementation of these measures:

a. Relocation of the drainage tray from the secondary road to the main carriageway, namely between the guardrails and the noise barrier (see Figure 30)

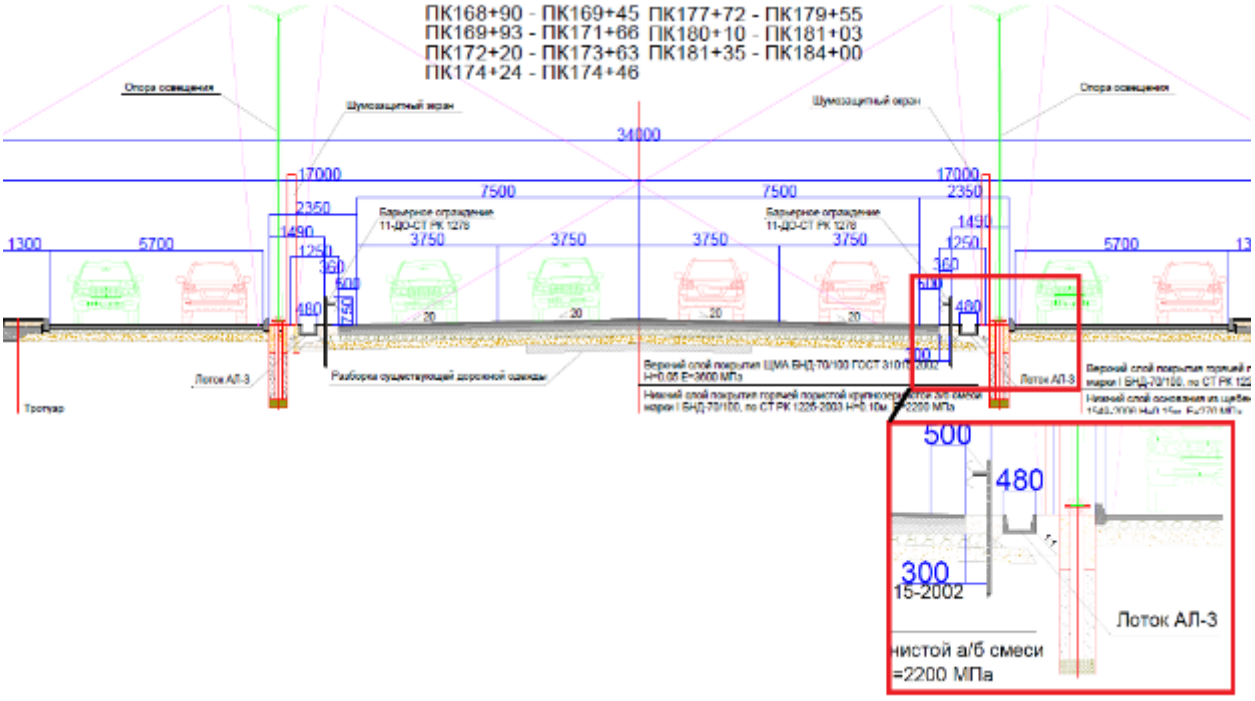


Figure 30 - Detail (guardrails, drainage tray, noise barrier and lighting pole)

b. In local areas where parking for cars is provided, the width of the secondary road should be from 8.7 m to 11.5 m. (see Figure 31 and Figure 32)

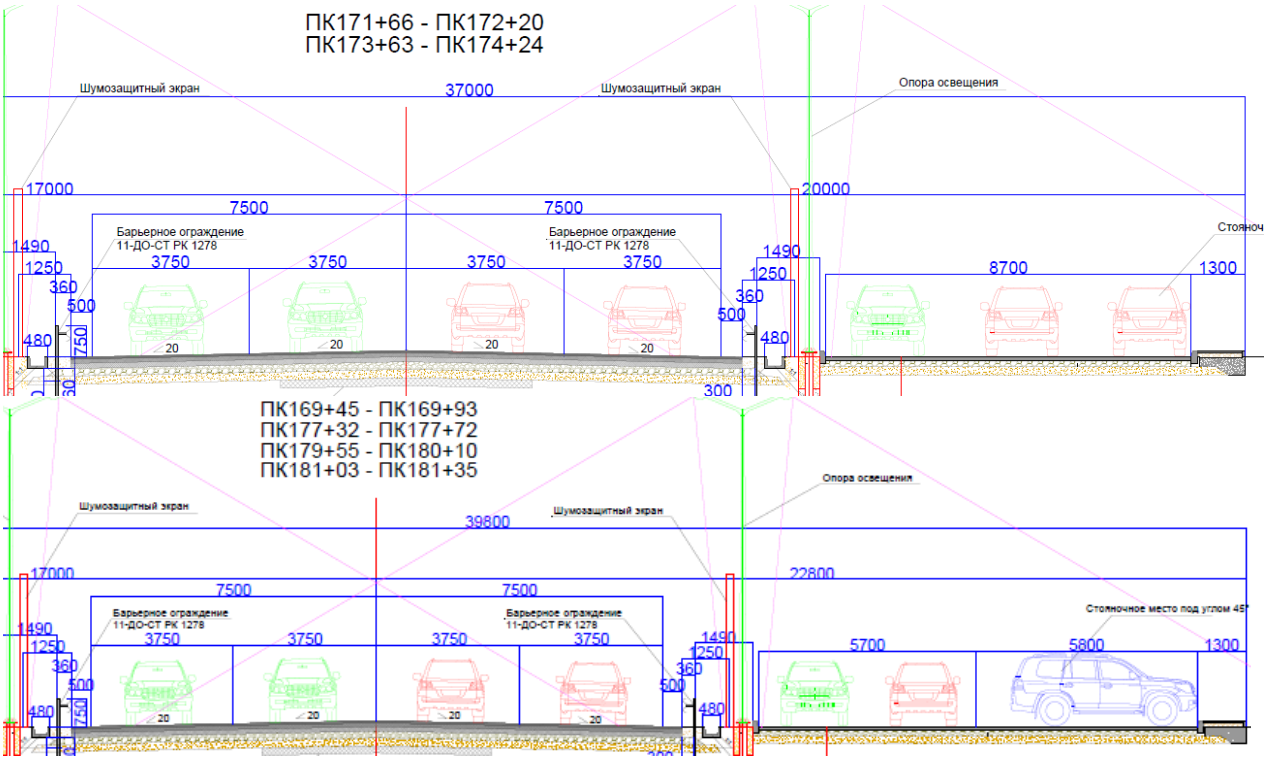


Figure 31 - Cross profile (secondary road width, right side)

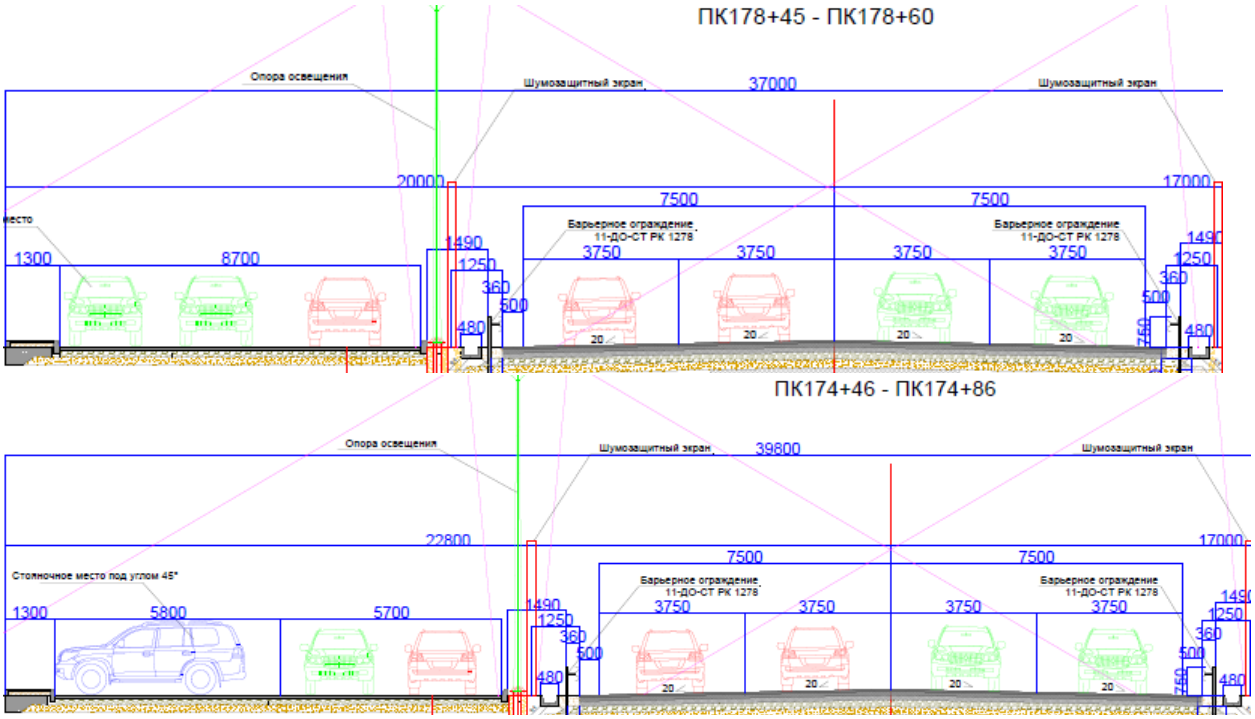


Figure 32 - Cross profile (secondary road width, left side)

111 A key element in achieving the above schemes is the installation of a noise barrier in combination with lighting poles.

As part of the study of this issue, the consultant requested a price quotation from the manufacturer of noise barriers (source: design and estimate documentation, quotation from the main supplier "Acoustic Structures Plant") (see Appendix G)

112 In addition, the opinion of the Project Designer was taken into account, based on the results of the discussion of options for installing a drainage tray and ensuring proper water flow, it is necessary to make appropriate design calculations, in particular, consider the possibility of increasing the level of coverage of a secondary road relative to the bottom of the drainage tray, and in places that allow for a spillway, provide drainage elements.

Figure 33 - Meeting and discussion of redesign issues with the Project Designer

113 *Assessing the impact on the star rating.* Changing the cross-section profile does not significantly affect the increase in the 4-star star rating for cars and motorcyclists. The movement of pedestrians and cyclists is brought to the local road, so there is no star rating value for them.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 60 km/h, taking into account proposals for changing the cross-section profile

Figure 34 – Impact on the main road, taking into account the change in the cross-section profile

114 According to the approved design and estimate documentation, the entrance to the village of Bestamak is not equipped with a exit to a secondary road (~PK164). In order to reduce traffic at the intersection of PK168 + 76.74, it is recommended to consider the possibility of organizing an exit with one-way traffic, followed by a transition to a turnaround area and two-way traffic, approximately before the start of a land plot with a private house (see Figure 35).

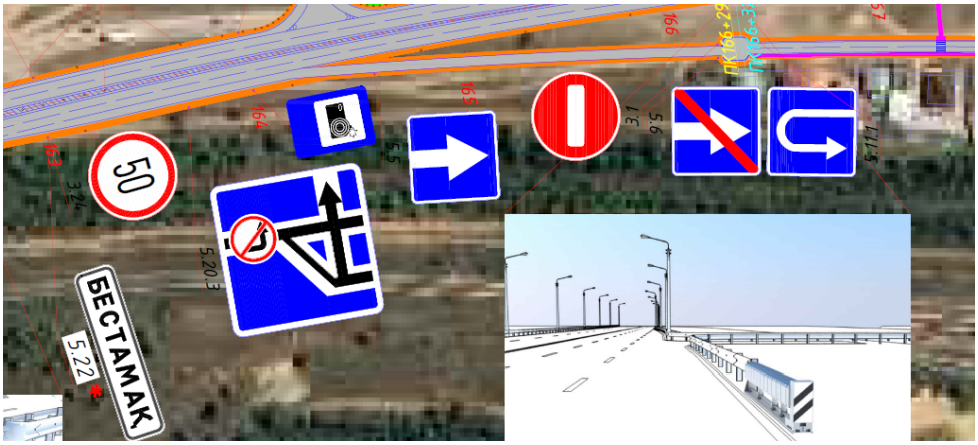
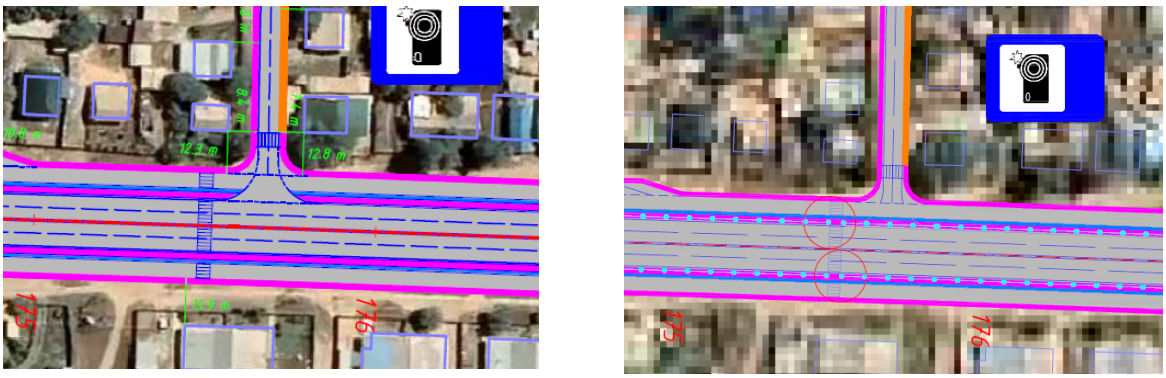


Figure 35 - One-way ramp and turnaround

115 The road facilities plan provides for an junction at PK175+68, however, the consultant recommends (i) to exclude the possibility of a vehicle leaving the adjacent road to the main carriageway, (ii) to keep the junction only to a secondary (local) road running along the main carriageway, (iii) to ensure interrupted installation of a noise barrier and barrier fencing, (iv) with

the installation of a pedestrian traffic light and horizontal markings of the pedestrian crossing. (see Figure 36)

116 These measures will eliminate the additional risk of a side collision of a local and transit vehicle, rupture of drainage trays and will narrow the gaps of the guardrails and noise screen.



According to design Proposal

Figure 36 - Exclusion of road junction with the main carriageway at PK175+68

117 *Assessing the impact on the star rating.* Exclusion the junction of the secondary road with the main roadway at PK175+68 (the pedestrian crossing remains) will eliminate the conflict point and improve the level of safety in this local area by 8 times. Thereby increase the star rating from 2 to 5 stars for cars and up to 4 stars for pedestrians and cyclists.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account proposals to exclude the junction at PK 175

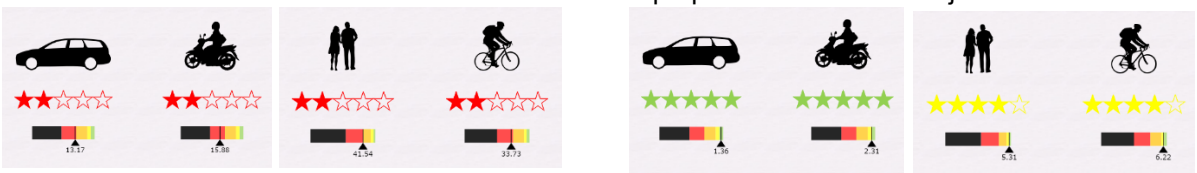
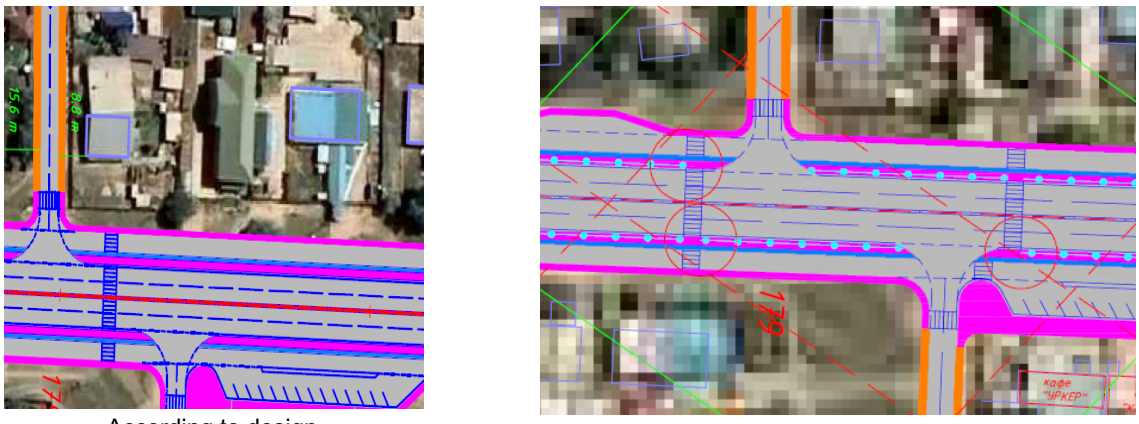


Figure 37 – Impact of junction exclusion on PK 175

118 The provided pedestrian crossing area along the main roadway is located between the junction at PK178+96.29 (left) and PK179+38.38 (right), which is less than 40 meters from the near edge of the roadway of the junctions. This can lead to an undesirable accumulation of vehicles making a "left turn" maneuver with accompanying pedestrian traffic at the intended location.

119 Thus, the consultant considers it necessary to separate pedestrian crossings and place them on each side of the exit, i.e. before junction at PK178+96.29 (left) and after PK179+38.38 (right) (see Figure 38).



According to design Proposal

Figure 38 - Relocation of the horizontal markings of the pedestrian crossing

120 *Assessing the impact on the star rating.* The division of pedestrian crossings, taking into account decisions on traffic lights and speed control, will improve the level of safety in this local area by 6 times. Thereby increase the star rating from 2 to 4 stars for all road users.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account a set of proposals

Figure 39 – Impact of junction exclusion on PK 175

121 The provided pedestrian crossing area on the main carriageway (PK182) is located between bus stops, which is unsafe for pedestrians and increases the risk of a vehicle colliding with a pedestrian, since the exit of a pedestrian directly in front of a standing bus will not allow a pedestrian, as well as a passing driver of a transit vehicle means to ensure the safety of traffic.
122 The consultant proposes to place a pedestrian crossing before the start of the bus stop located on the right, which will increase the visibility zone for drivers moving on the left and pedestrians crossing from the opposite side of the traffic (left) (see Figure 40)

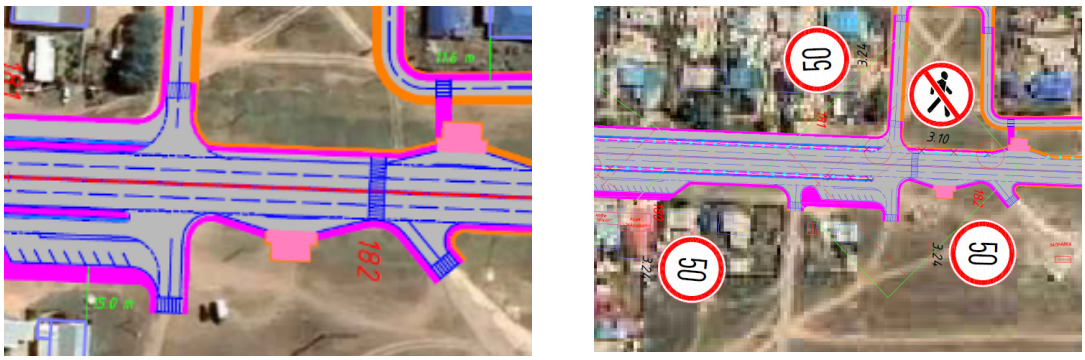


Figure 40 - Displacement of the horizontal markings of the pedestrian crossing

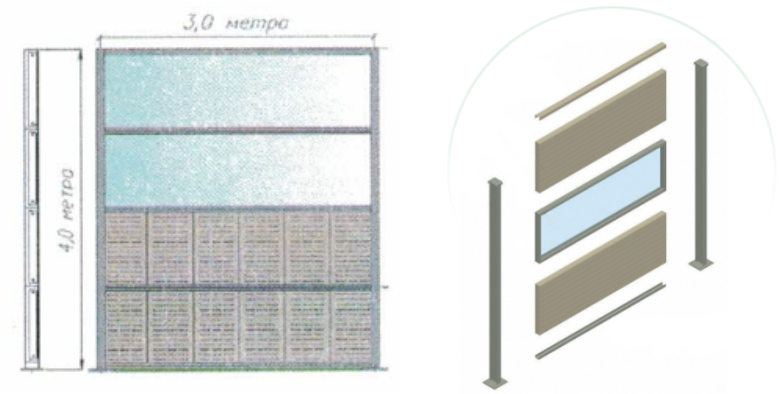
123 *Assessing the impact on the star rating.* Displacement the horizontal markings of a pedestrian crossing, together with changing the speed limit at pedestrian crossings, taking into account recommendations on smart traffic lights, linear speed gauges and signs, improves the level of safety for pedestrians by more than 10 times. Thereby increase the star rating for pedestrians from 1 to 4 stars.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account proposals for traffic regulation

Figure 41 – Impact of displacement of pedestrian crossing markings on PK 181

Controlling noise emissions in the area and ensuring visibility in the area.
124 *Description of design solutions.* In accordance with the design documentation, installation of noise (acoustic) screens at 3057 linear meters, with an area of 12,228 m2 is not provided for on the section of the road along the settlement of Bestamak. Consequently, the risk of a permanent negative impact of noise emission on the population living in the Bestamak settlement increases significantly.



according to the design 3 057 l.m. 12 228 m2
thickness: 12mm

JSC "Plant of Acoustic Structures", RF	JSC "Promdomakustika", RF	JSC “ALSTROY HOLDING”, RK
Total cost: 634.2 million tenge.	Total cost: 609.1 million tenge.	Total cost: 370.5 million tenge.

Figure 42 – Options of noise screens

125 *Description of the problem.* According to the ADB memorandum dated June 21-25, 2021, it was noted that there are several issues related to the arrangement of the road section passing through the Bestamak village, in particular, the installation of noise barriers.

126 This issue was worked out by the CSC together with KAZh, during which the opinions of the population were taken into account, especially the commercial sector of the Bestamak settlement, whose livelihood is associated with the provision of food, recreation and repair of vehicles.

127 The main agreement reached is the installation of noise barriers with transparent panels, which will ensure the visibility of advertising signs of commercial points (cafes, service stations, etc.). The estimated volume of noise barriers is about 3,057 l.m.

128 However, the proposed scheme for installing noise barriers does not represent the possibility of achieving the required level of visibility at intersections and junctions. So, according to Table 1 TMP 503-0-51.89-19 “Intersections and junctions of roads at the same level. Album 1. (page 21) at the design speed of 60 km/h, the minimum visibility distance for stopping is 85 meters from the edge of the secondary road. Taking this calculation, the design solution does not provide 50% of the established visibility requirements, which may lead to a traffic accident.

129 *Description of the solution.* As indicated in the clause Results of Road Safety Audit of the Report, the consultant recommends reducing the established maximum speed limit to 50 km/h, which is in accordance with Table 1 TMP 503-0-51.89-19 “Intersections and junctions of roads at the same level. Album 1. (page 21) will reduce the required visibility distance for stopping to 75 meters from the edge of the secondary road. However, this measure will not fully ensure the achievement of the required level of visibility.

130 Thus, in order to reduce regulatory deviations, the consultant also recommends the elimination of a number of sections of the noise barrier while maintaining the barrier fence, relying on buildings along intersections and junctions on the site. (see Figure 43, Figure 44 and Figure 45)

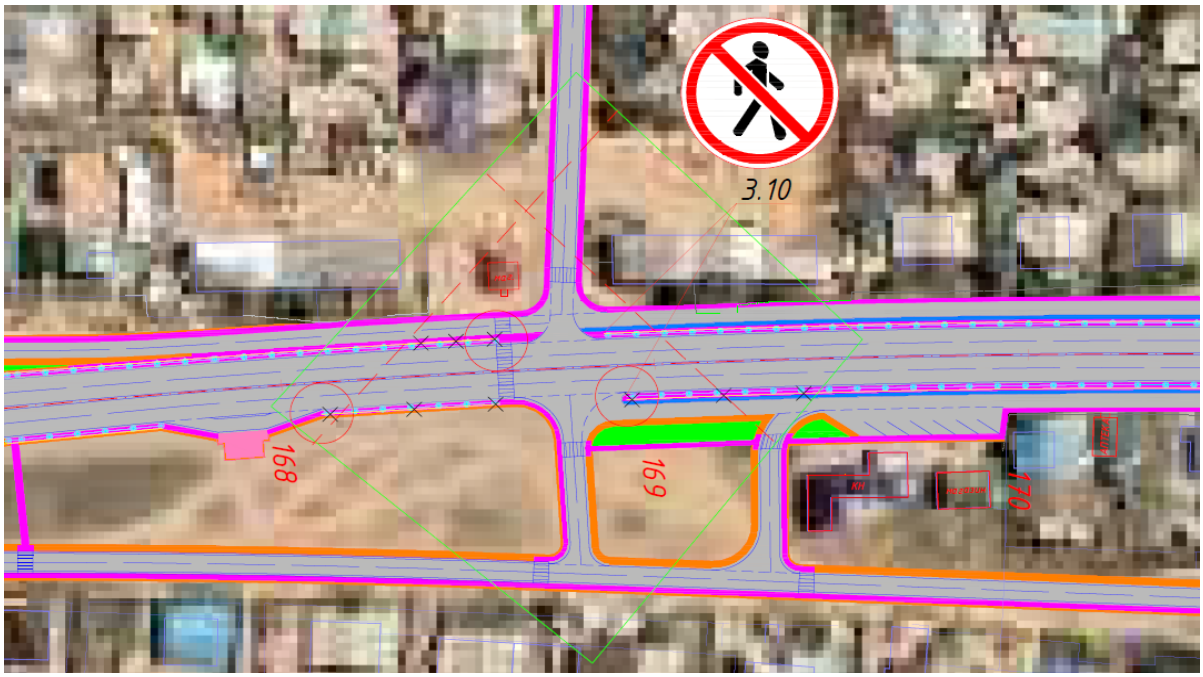


Figure 43 - Scheme of exclusion of volumes of noise barriers, with the maximum possibility of ensuring visibility at the intersection of PK168 - PK169

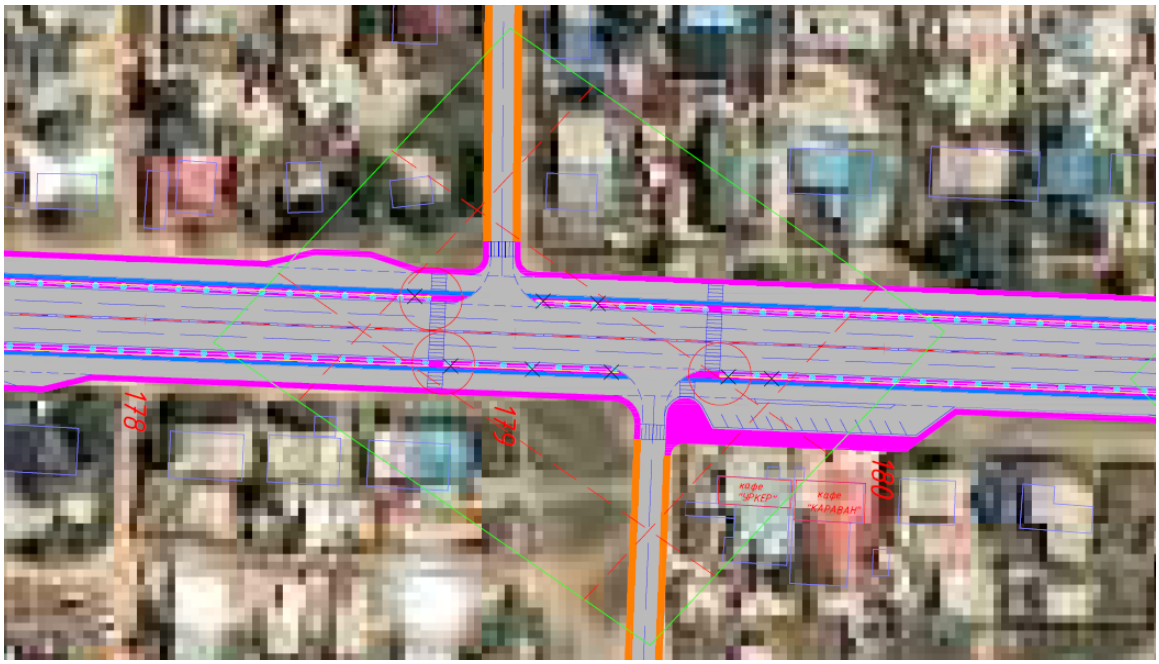


Figure 44 - Scheme of exclusion of volumes of noise barriers, with the maximum possibility of ensuring visibility at the intersection of PK178-PK179

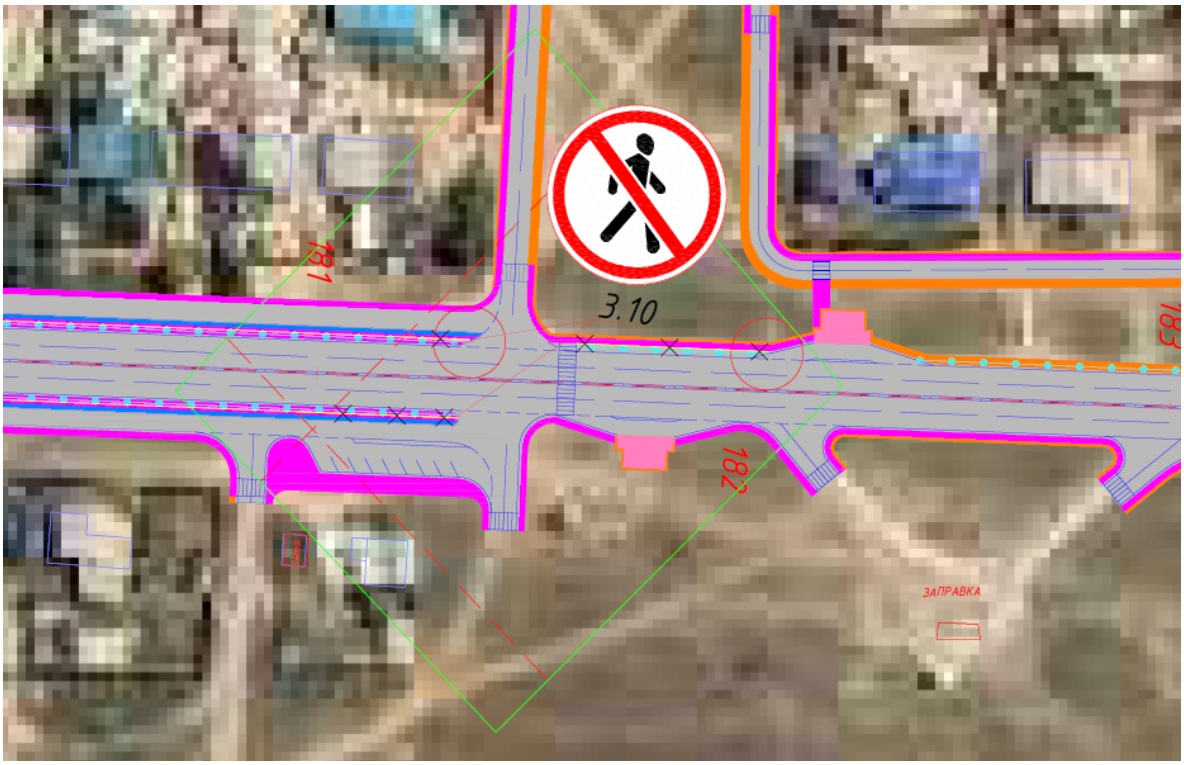


Figure 45 - Scheme of exclusion of volumes of noise barriers, with the maximum possibility of ensuring visibility at the intersection of PK182

131 At the same time, taking into account the recommendation of the consultant according to clause 115 (see Figure 36) there is a need for additional installation of a noise barrier, as well as a guardrails and a drainage tray. (see Figure 46)

Figure 46 - Section with additional installation of a noise barrier due to the exclusion of junction to the main roadway

132 Thus, the total length of the installation of the noise barrier will be about 2,736 l.m. (it is necessary to clarify the actual volume when redesigning the development plan).

133 *Assessing the impact on the star rating*. Changing the speed limit at pedestrian crossings, taking into account the recommendations on smart traffic lights, linear speedometers and signs, improves the level of safety for all participants by 3 times. Thereby increase the star rating from 2 to 4 stars for cars and pedestrians.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account proposals for traffic regulation

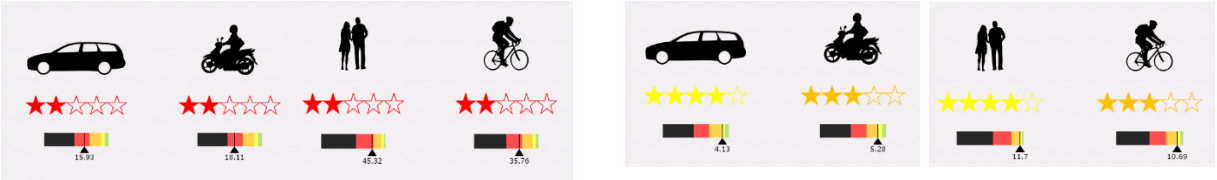


Figure 47 – Impact of improved visibility at intersections

Safety elements of guardrails ends

134 *Description of design solutions*. In accordance with the design documentation, installation of noise (acoustic) barriers at 3057 linear meters is not provided for on the section of the road along the settlement of Bestamak, which, according to clause 5.1.18 of GOST 32957 “Acoustic barriers. Technical requirements” the distance from the acoustic barrier to the roadway can be reduced if installed on the 11DO highway. In addition, PK 162 and PK 187 are provided with a dividing guardrails 11DD.

135 *Description of the problem*. According to paragraph 244 of the CAREC Road Safety Engineering Manual No. 3 Roadside Obstacle Management, fishtail barrier guardrail ends are prohibited from being used at the beginning sections of semi-rigid guardrails, especially in high speed driving modes. In the event of a frontal collision with it, it can enter the vehicle and cause serious injury to the driver and passengers.

136 iRAP does not consider this type of end and begin sloping element of guardrails as a safe end (potentially to throw vehicles into the air and cause them to roll over). These guardrails terminals do not have shock absorbing properties to dissipate impact energy. At the same time, the risk factor for an accident between the specified object and the metal guardrails increases 5 times (from 12 to 60).

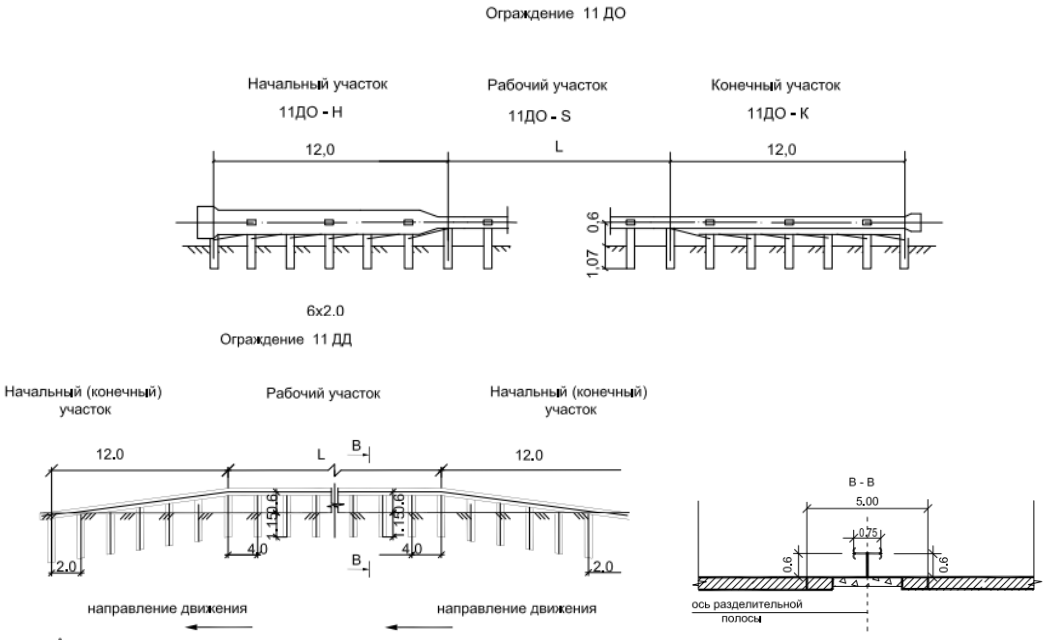
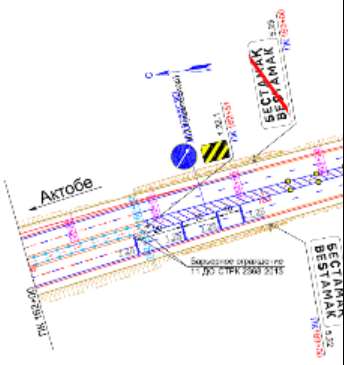
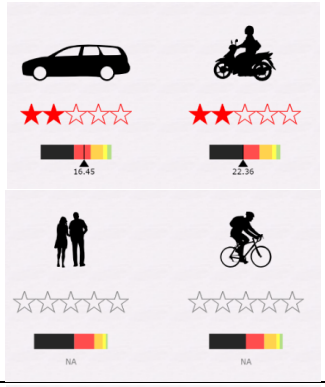
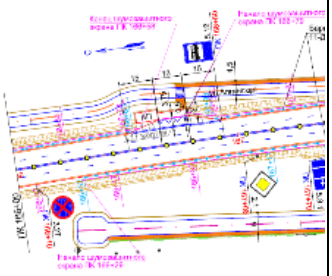
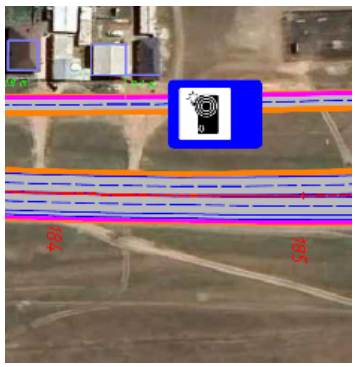
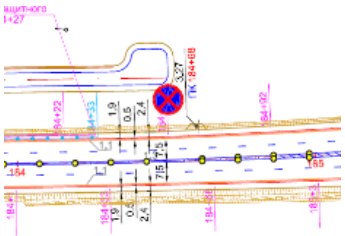
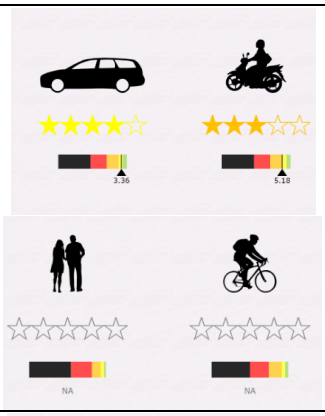
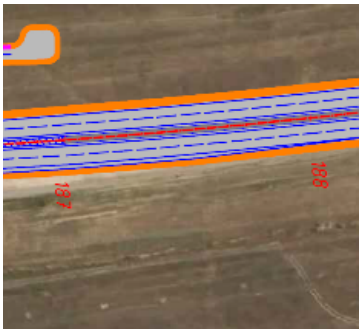
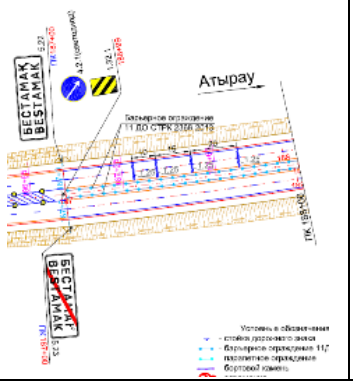
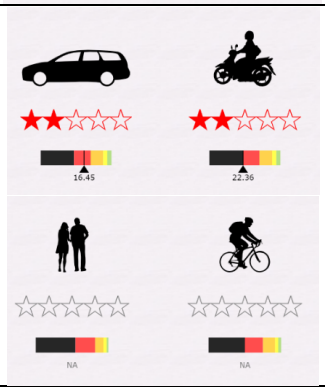


Figure 48 – Guardrails 11 DO and 11 DD provided for in the project

137 In addition, during the clarification, no sections were identified with a length of the main section of the fence less than 30 m, which corresponds to paragraph 208 of the CAREC Manual No. 3: Roadside Hazard Management “208. The minimum length of the barrier guard is normally 30 m plus appropriate begin and end terminals.”.

138 In general, the project identified 15 dangerous objects with similar dangerous begin elements of guardrails, of which 4 are the most dangerous objects: 2 on the median strip and 1 each at the entrance to Bestamak, where the speed limit is quite high.

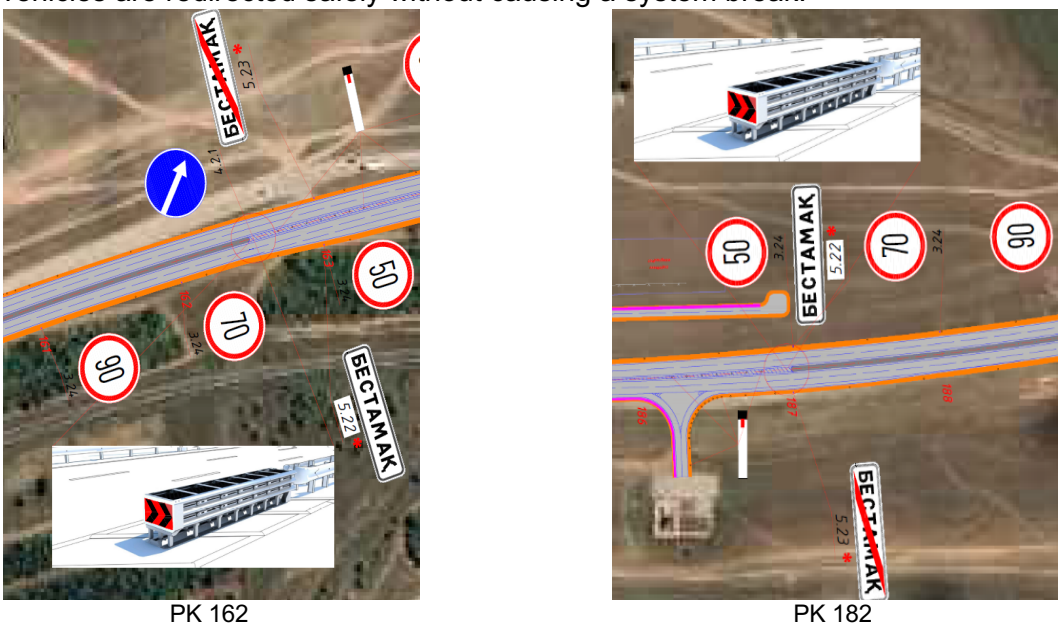
Table 23 – Unsafe Curved Bar Ends

PK	Project road (sketch as of 08.04.2023)	Project road (TM scheme)	SR iRAP – under design
162			
166			
184			
187			

139 *Description of the solution.* To improve the safety of metal fences, it is proposed to use an end damper means in accordance with ST RK EN 1317-4 for the begin and and elements of a metal guardrails. Front damping guardrails for 11 DD and side retaining barrier guards for 11 DO.

140 The peculiarity is the complete absorption of energy in a collision without destroying the fence itself. In a frontal collision (tested at a speed of 110 km/h), the steel movable end piece is

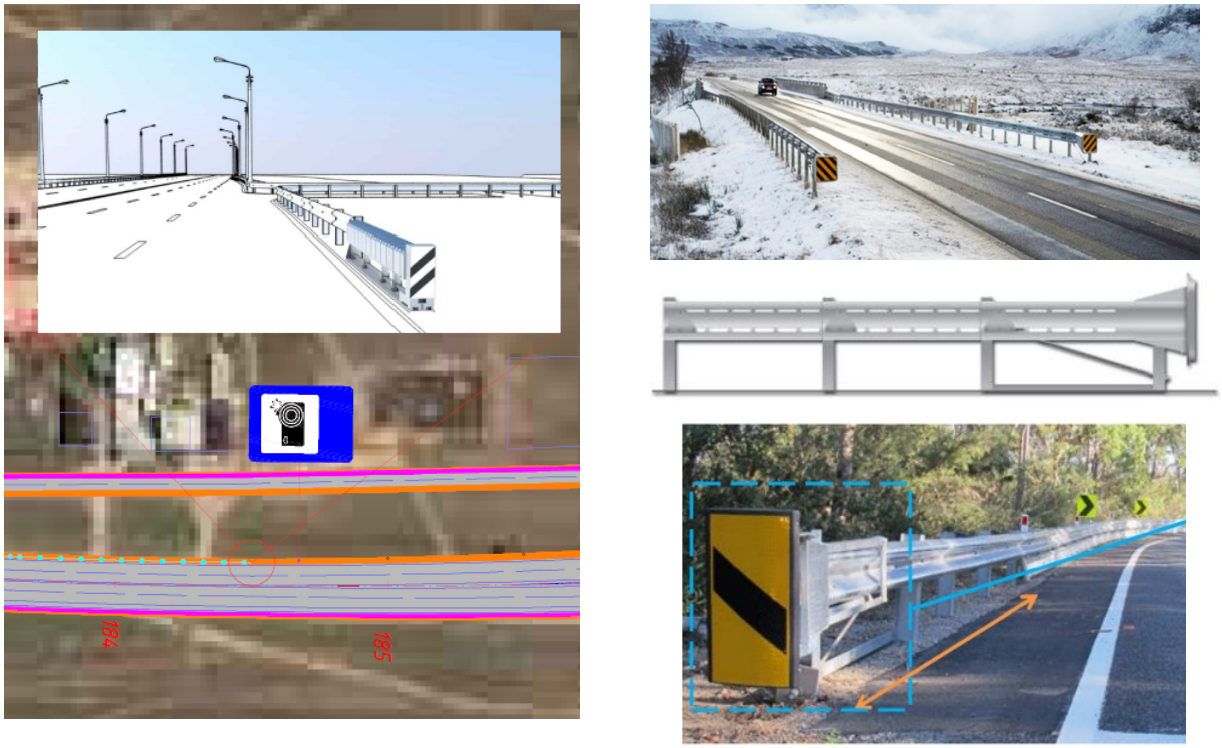
displaced to the rear, absorbing the impact energy, while the car drives onto the rail. In a side impact, vehicles are redirected safely without causing a system break.



PK 162 PK 182

Figure 49 – Frontal damping guardrails to 11 DD

141 The remaining guardrails inside the settlement of Bestamak, in accordance with paragraph 246 of the CAREC Manual No. 3 "Roadside Hazard Management", it is allowed to use fishtail type guardrails in sections with a speed of less than 80 km/h. Thus, by reducing the speed limit to 50 km/h, the barrier guards are not removed. It should be noted that the point exclusion of noise screens should not lead to the exclusion of a curved beam 11 DO inside the settlement, acting as protection for vulnerable road users (pedestrians and cyclists).



PK 166 and PK 184 Examples according to ST RK EN 1317-4

Figure 50 – Side damping guard rails for 11 DD

142 *Assessing the impact on the star rating.* Changing the damping means on the begin and end elements of the metal guardrails allows to improve the level of safety for all participants by 3 times. Thereby increase the star rating from 2 to 4 stars for cars and pedestrians.

According to the project and sketch as of 08.04.2023 at 60 km/h

at a speed of 50 km/h, taking into account proposals for the traffic management

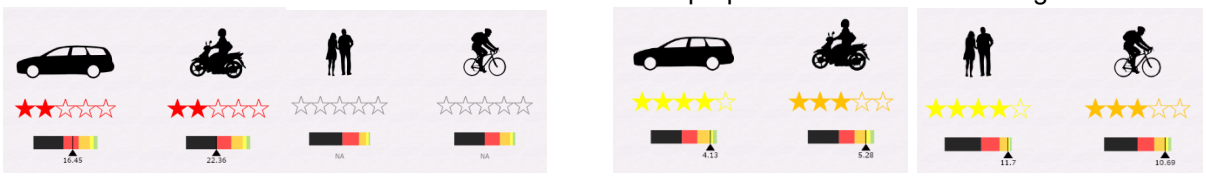


Figure 51 – Influence of guardrails ST RK EN 1317-4 arrangement

B. Star rating comparison before and after SR4D

143 *Comparison of encodings.* As a result of comparing the proposals of the existing project and the proposals of the road safety audit, the coding matrices of road attributes are formed.
144 *Star raiting.* Based on the encoded and validated data, ViDA calculates the star rating of the network's road survey. The star rating is based on the individual relative risk for four groups of road users - drivers and passengers of vehicles, motorcyclists and cyclists. Due to the lack of vehicle passengers, motorcyclists and cyclists, only a star rating has been created for cars.
145 The following figures show an overview of the results of the Star Rating on an existing project road and taking into account the safety audit proposals. The comparison table shows that the proposed recommendations give the possibility to achieve a value of 3 or more stars from 72% to 100%.

Table 24 – Comparison of SR before and after RSA and SR4D

The results of the average star rating for cars on the map		
Current road	Designed	After RSA
		

Результаты усреднённого звёздного рейтинга

Current road

Star Ratings	Vehicle Occupant		Motorcyclist		Pedestrian		Bicyclist	
	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
3 star or better	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
5 Stars	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
4 Stars	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
3 Stars	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
2 Stars	1.20	38.71%	0.30	9.68%	0.00	0.00%	0.00	0.00%
1 Star	1.90	61.29%	2.80	90.32%	2.00	64.52%	1.60	51.61%
Not applicable	0.00	0.00%	0.00	0.00%	1.10	35.48%	1.50	48.39%
Totals	3.10	100.00%	3.10	100.00%	3.10	100.00%	3.10	100.00%

Designed

Star Ratings	Vehicle Occupant		Motorcyclist		Pedestrian		Bicyclist	
	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
3 star or better	2.70	87.10%	2.10	67.75%	0.30	9.68%	0.00	0.00%
5 Stars	0.00	0.00%	0.00	0.00%	0.30	9.68%	0.00	0.00%
4 Stars	2.00	64.52%	0.10	3.23%	0.00	0.00%	0.00	0.00%
3 Stars	0.70	22.58%	2.00	64.52%	0.00	0.00%	0.00	0.00%
2 Stars	0.00	12.90%	1.00	32.26%	0.30	9.68%	0.40	12.90%
1 Star	0.00	0.00%	0.00	0.00%	0.10	3.23%	0.00	0.00%
Not applicable	0.00	0.00%	0.00	0.00%	2.40	77.42%	2.70	87.10%
Totals	3.10	100.00%	3.10	100.00%	3.10	100.00%	3.10	100.00%

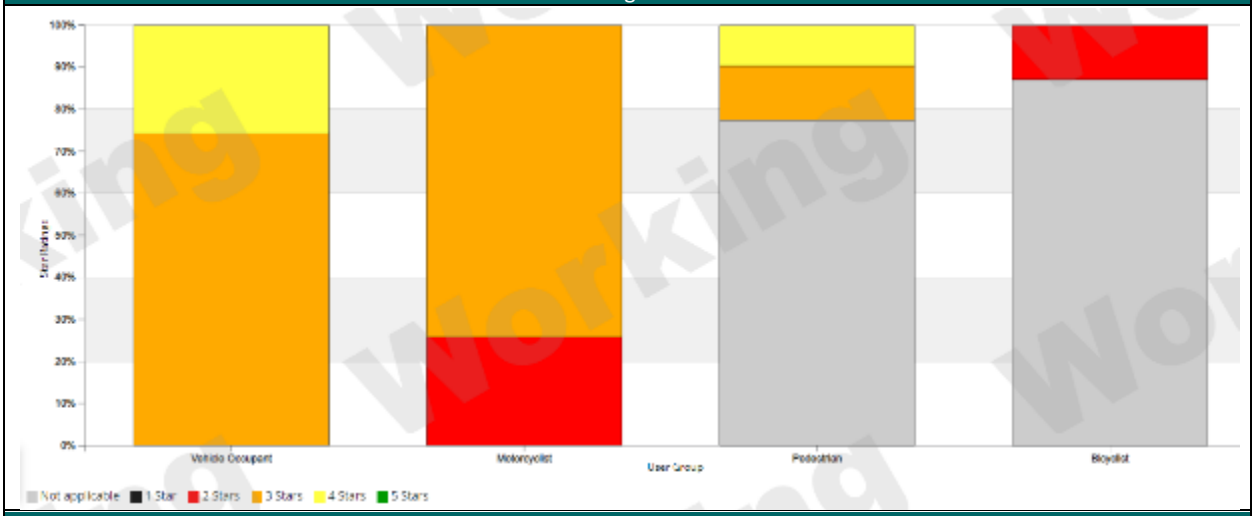
After RSA

Star Ratings	Vehicle Occupant		Motorcyclist		Pedestrian		Bicyclist	
	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
3 star or better	3.10	100.00%	2.90	93.55%	0.60	19.35%	0.40	12.91%
5 Stars	2.00	64.52%	1.60	51.61%	0.20	6.45%	0.00	0.00%
4 Stars	1.10	35.48%	0.50	16.13%	0.40	12.90%	0.30	9.68%
3 Stars	0.00	0.00%	0.80	25.81%	0.00	0.00%	0.10	3.23%
2 Stars	0.00	0.00%	0.20	6.45%	0.00	0.00%	0.00	0.00%
1 Star	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Not applicable	0.00	0.00%	0.00	0.00%	2.50	80.65%	2.70	87.10%
Totals	3.10	100.00%	3.10	100.00%	3.10	100.00%	3.10	100.00%

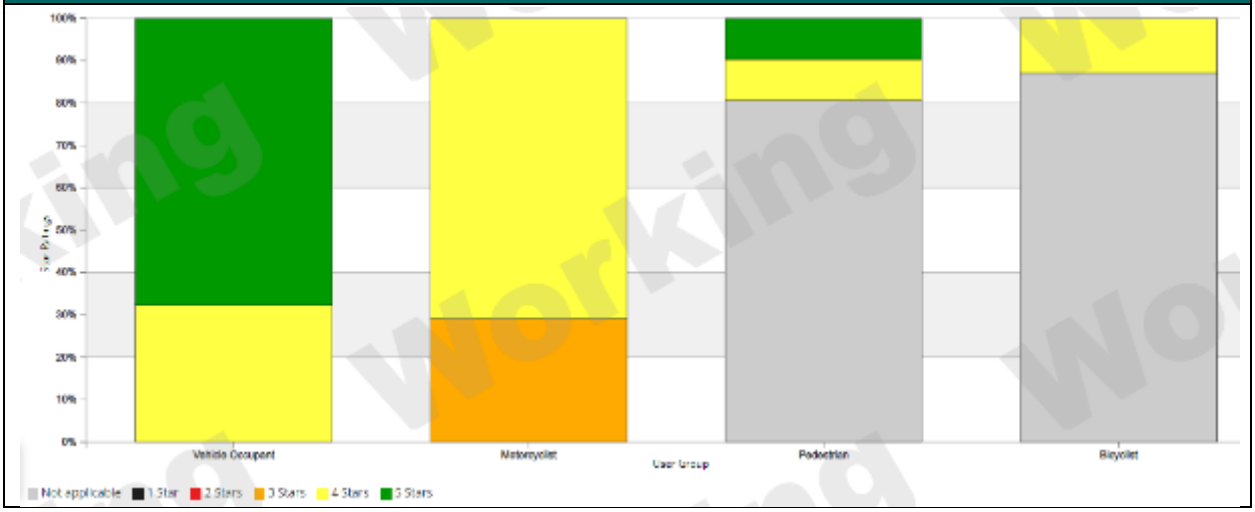
Base star rating results for cars in the chart - smoothed

Current road

Designed



After RSA



146 Calculation of accident consequences in VIDA on an existing project road and safety audit proposals, fatalities and serious injuries risk was optimized by 17% from 5.2 to 4.3 per year between the design road and recommendations. Whereas this indicator with the current road is 50% for the project and 59% for the road, taking into account the road safety. Within 20 years, the recommendations will save the lives of 3 people in fatal road accidents and 16 people with serious injuries.

Table 25 – Comparison of crash consequences before and after RSA/SR4D

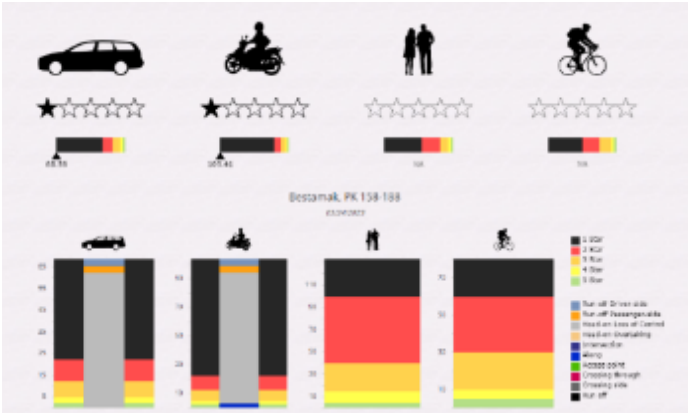
	Current road	Designed	After RSA	Difference
Risk of injury and death	10.5	5.2	4.3	-0.9
Risk of fatalities	0.9	0.9	0.8	-0.1
Risk of serious injury	9.6	4.3	3.5	-0.8

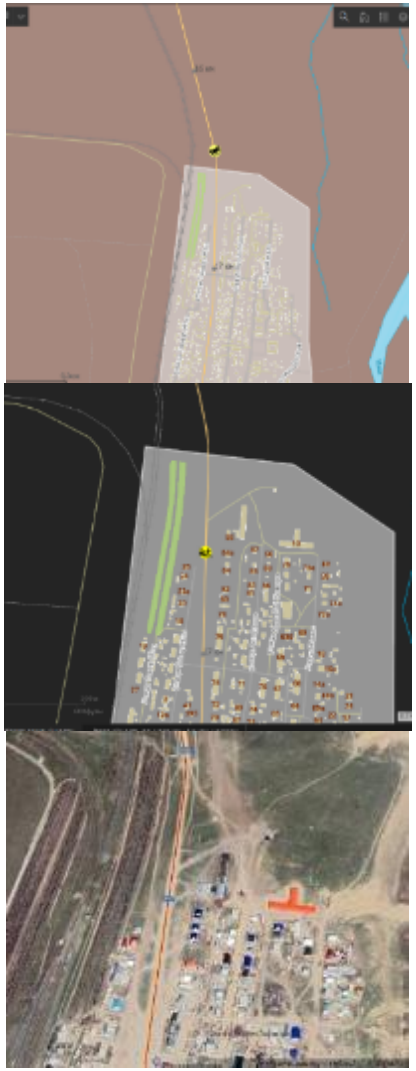
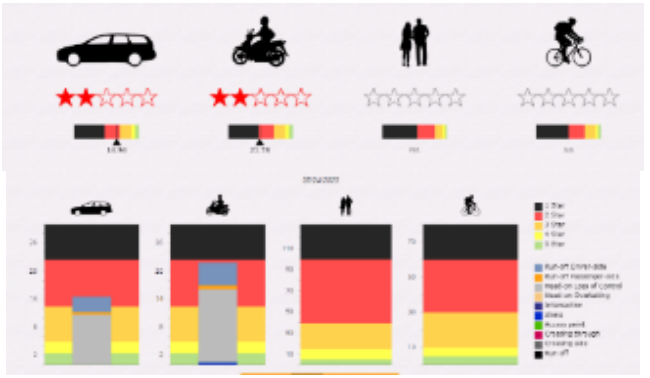
ANNEX A - PROJECT ACCIDENT REPORT

Interpretation of the report on the accident on the road of republican significance A-27 "Aktobe - Atyrau - RF b-r (to Astrakhan)" (section of the village of Bestamak)

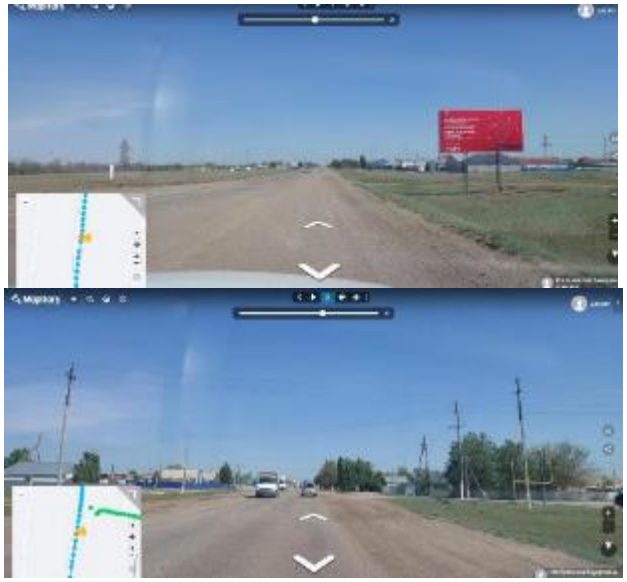
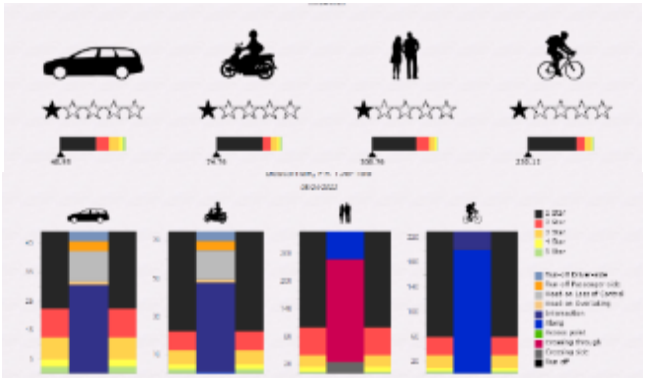
Region	Source	Index	RTA address, km	Date	Accident type	Accident reason	Number of accidents	Died	Injured
Aktobe	KAZh	A-27	19	05.01.2015	Collision	Over speed	1	5	5
Aktobe	KAZh	A-27	19	20.02.2015	Collision	Departure to the opposite lane	1	0	1
Aktobe	KAZh	A-27	17	03.08.2015	Rollover	Lost control	1	2	1
Aktobe	KAZh	A-27	16	19.08.2015	Collision	Departure to the opposite lane	1	0	1
Aktobe	KAZh	A-27	17	29.10.2016	Collision	Departure to the opposite lane	1	0	1
Aktobe	KAZh	A-27	18	28.08.2018	Rollover	Gross traffic violations	1	0	1
Aktobe	RTA map	A-27	17	03.03.2019	Pedestrian collision	Violation of pedestrian crossings	1	0	1
Aktobe	RTA map	A-27	18	13.05.2019	Collision	Violation of the rules of overtaking	1	1	5
Aktobe	KAZh	A-27	16	19.11.2019	Rollover	Over speed	1	0	1
Aktobe	RTA map	A-27	18	24.01.2020	Collision	Failure to keep distance	1	0	1
Aktobe	RTA map	A-27	16	11.08.2020	Pedestrian collision	Other	1	0	1
Aktobe	RTA map	A-27	18	12.11.2020	Hitting a vehicle	Driving a vehicle while intoxicated	1	0	1
Aktobe	KAZh	A-27	18	19.12.2020	Collision	Over speed	1	0	2
Aktobe	RTA map	A-27	18	29.12.2020	Collision	Failure to comply with traffic signs	1	0	1
Aktobe	RTA map	A-27	16	03.01.2021	Rollover	Other	1	0	4
Aktobe	KAZh	A-27	18	25.01.2021	Collision	Over speed	1	1	4
Aktobe	RTA map	A-27	15	13.08.2021	Collision	Violation of the rules of overtaking	1	0	5
Aktobe	RTA map	A-27	17	16.10.2021	Pedestrian collision	Other traffic violations by pedestrians	1	0	1
Aktobe	KAZh	A-27	16	10.05.2022	Collision	Violation of the rules of overtaking	1	0	1
						Total for 2015-2022	**19.00**	**9.00**	**38.00**
						Accident severity per 1 km (4 km)	**0.59**	**0.28**	**1.19**
						Average over 8 years	**2**	**1**	**5**

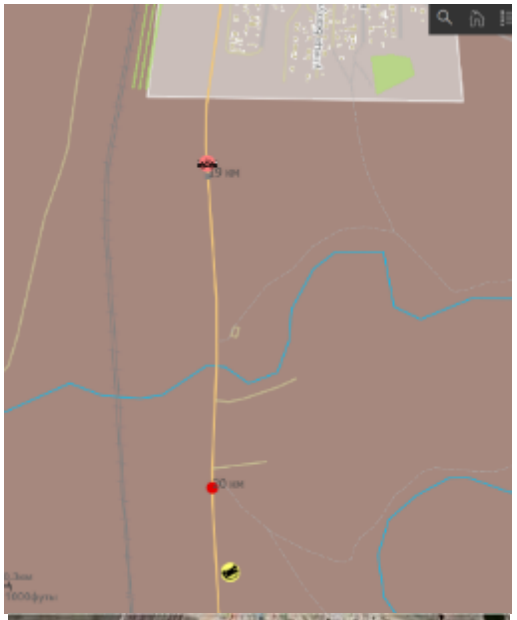
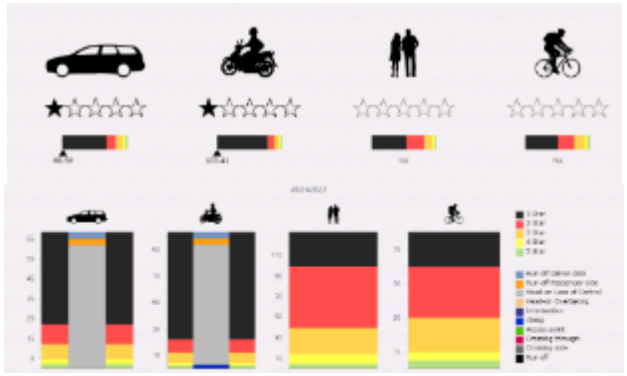
ANNEX B: STATISTICS OF ACCIDENTS IN THE AREA OF BESTAMAK VILL.

Km	Information about the accident	Accident map data	Information
km 15 Junction to the left - turn to the cemetery	Period: 2015-2022 Number of accidents: 1 Type of accident: collision; Injured: 5 people Died: 0 people Type of violation: violation of the rules of overtaking.	https://gis.kgp.kz/portal/apps/opsdashboard/index.html#/8c75cd6823ce42c5824fa637674c5b9b  	https://www.mapillary.com/app/?lat=50.065328100016984&lng=57.34415909999905&z=14.612973229050901&pKey=1892652437758216&focus=photo  SR iRAP: 1 star: very dangerous area; The risk of serious RTAs - 0.32 per year RTA risk: frontal collisions and rollovers. 

Km	Information about the accident	Accident map data	Information
km 16 Approach to Bestamak settlement up to 1 crossroad	Period: 2015-2022 Number of accidents: 5 Type of accident: collision (2), collision with a pedestrian (1), rollover (2) Injured: 5 people Died: 0 people Type of violation: speeding, violation of the rules of overtaking, driving into the oncoming lane.	https://gis.kgp.kz/portal/apps/opsdashboard/index.html#/8c75cd6823ce42c5824fa637674c5b9b 	https://www.mapillary.com/app/?lat=50.0574792&lng=57.347497249725&z=17&pKey=637143754555303&focus=photo  SR iRAP: 3 stars: very dangerous area; The risk of serious RTAs - 1.02 per year RTA risk: frontal collisions and rollovers. 

Km	Information about the accident	Accident map data	Information
km 17 Passage through the village of Bestamak	Period: 2015-2022 Number of accidents: 4 Type of accident: collision (1), collision with a pedestrian (2), rollover (1) Injured: 4 people Died: 2 people Type of violation: driving into the oncoming lane, violation of pedestrian crossings, other violations of traffic rules by pedestrians	https://gis.kgp.kz/portal/apps/opsdashboard/index.html#/8c75cd6823ce42c5824fa637674c5b9b  	https://www.mapillary.com/app/?lat=50.0416988&lng=57.3457924&z=17&pKey=261775549738975&focus=photo  SR iRAP: 1 star: very dangerous area; The risk of serious RTAs - 0.47 per year RTA risk: intersection, head-on collisions and pedestrian crossing. 

Km	Information about the accident	Accident map data	Information
km 18 Passage through the village of Bestamak and exit	Period: 2015-2022 Number of accidents: 7 Type of accident: collision (5), collision with a vehicle (1), rollover (2) Injured: 15 people Died: 2 people Type of violation: speeding, violation of overtaking rules, others.	https://gis.kgp.kz/portal/apps/opsdashboard/index.html#/8c75cd6823ce42c5824fa637674c5b9b 	https://www.mapillary.com/app/?lat=50.036424469800002&lng=57.344669800002&z=17&pKey=555629456759741&focus=photo  SR iRAP: 1 star: very dangerous area; The risk of serious RTA - 0.47 per year RTA risk: Intersection, Head-on Collisions and Pedestrian Crossing. 

Km	Information about the accident	Accident map data	Information
km 19 Exit from the village of Bestamak. Approaches to the Ak Kus poultry farm	Period: 2015-2022 Number of accidents: 2 Type of accident: collision (2) Injured: 6 people Died: 5 people Type of violation: speeding, driving into the oncoming lane.	https://gis.kgp.kz/portal/apps/opsdashboard/index.html#/8c75cd6823ce42c5824fa637674c5b9b  	https://www.mapillary.com/app/?lat=50.026255399998&lng=57.344805399998&z=17&pKey=624412383048018&focus=photo   SR iRAP: 1 star: very dangerous area; The risk of serious RTA - 0.32 per year RTA risk: frontal collisions due to loss of control 

ANNEX C: RSA CHECKLIST

ROAD SAFETY AUDIT CHECKLISTS FOR THE DEVELOPMENT OF WORKING DOCUMENTATION

Problem	Yes	No	NA	Comments
1. Plan and profile				
Are the route plan and profile comply with the requirements of safe visibility?	Yes			There are problems due to noise barriers
Is the route profile safe enough for all road users, especially for large trucks and buses that can lose speed on excessive gradient?		No		
Are there sufficient opportunities for "safe" overtaking?	Yes			
2. Typical cross-section profiles				
Will the width of all lanes, curbs and median strip be safe for the expected traffic intensity and composition of traffic flow?	Yes			
In particular, is the width of the profile sufficient to provide protected lanes for turning on the median strip?		No		There are local sections at intersections
Is the width of the median strip sufficient for the safe installation of street lighting during the proposed works or later?	Yes			
Will the median strip be wide enough and free enough to serve as an effective survival area for pedestrians?		No		The dividing is restrictived with double white lines
Ia it proposed to strengthen the shoulders?			NA	
Do shoulders continue on bridges and overpasses?			NA	
Are passing lanes and/or ascending gradient lanes provided, especially in hilly areas?			NA	
Are safety measures in place for disabled vehicles and rescue vehicles?			NA	
3. Connection of the new road to the existing one				
Will the connection of existing road to new facility be safe?		No		There are local sections at intersections
4. Work in stages				
If the project involves construction in stages, are the stages organized in such a way as to ensure maximum safety?			NA	
Is it safe to cross between sections of the road without a median strip and sections with a median strip (in both directions)?		No		The end elements of the guardrails are not safe
5. Intersections				
Are the types of intersections (right-angle crossing, T-junction, roundabout, traffic lights) appropriate and safe?		No		It is proposed to close the T-shaped intersection with a guardrails and straighten the X-shaped intersection
Does the design provide an unobstructed view that is not restricted by obstructions such as structures, fences, trees, or parking lots?		No		There are problems due to noise barriers
Will traffic signals at intersections be clearly visible and understandable?		No		On adjacent roads, it is necessary to regulate in order not to reduce the capacity of the road
Will traffic light times be safe?	Yes			Smart traffic lights are proposed
Is there sufficient time for all traffic and pedestrians to move at traffic lights?	Yes			
Are there pedestrian traffic light buttons, as well as appropriate pedestrian traffic lights, at each corner of the intersection?	Yes			

continued on next page

table continuation

Problem	Yes	No	NA	Comments
In the case of a roundabout, is there sufficient turning angle for entry from all directions?			NA	
Are appropriate signs installed before entering the roundabout from all directions?			NA	
Are Stop and Yield signs specified for other types of intersections, and are they positioned for maximum visibility?	Yes			
6. Intersections				
Is there clear visibility without obstruction at all junctions and branches of the road?			NA	
Are the distances between decision points sufficient to ensure safety?			NA	
Is the sign layout for each intersection clear and easily understood by road users?			NA	
Have all roadside hazards been dealt with in accordance with the roadside hazard management strategy?			NA	
7. Adjacent lands				
Are all approaches from/to adjacent land/property safety?	Yes			
Is fencing provided in rural areas to prevent animals from entering the road?	Yes			
8. Roadside Hazard				
Has a roadside hazard management strategy been applied?	Yes			
Are guardrails proposed to be installed only where they are needed?	Yes			
Is the proposed type of guardrails suitable for the particular section of the road?	Yes			
Do the standard drawings show that the guardrail ends will be of a safe enough type?		No		Guardrails ends are not safe
Do the standard drawings show safe connections of guardrails with bridge piers, along with a corresponding reduction in strut spacing to reinforce the guardrail and prevent "pockets" forming.		No		
9. Vulnerable road users (pedestrians, cyclists, motorcyclists and horse-drawn vehicles)				
Will all vulnerable road users be able to pass along their routes in a coherent manner while maintaining sufficient lateral clearance relative to moving vehicles?	Yes			
Will pedestrians (especially young people, the elderly and people with disabilities) be able to walk safely on both sides of the road?	Yes			
Does the proposed project lack "narrow spaces" where vulnerable road users could be endangered by moving vehicles?	Yes			
Will pedestrians (especially young people, the elderly and people with disabilities) be able to safely cross the road?		No		There are problems at pedestrian crossings
Are all reinforced concrete curbs low enough not to obstruct pedestrians?	Yes			
Are there ramps at all intersections and in the middle of blocks at pedestrian crossings?		No		
If formal crossing are proposed, are they clearly visible from all directions?		No		
Are appropriate signs and road markings provided in all areas for pedestrian traffic?	Yes			

continued on next page

table continuation

Problem	Yes	No	NA	Comments
Will all crossings be illuminated at night to give drivers/motorcyclists a good view of pedestrians?	Yes			
If traffic lights are proposed in the middle of blocks, will they be equipped with push buttons for pedestrians?	Yes			
Are there walkways across median lanes that allow crossing the road “at road level” and make it easier for people with disabilities to cross?	Yes			
10. Road signs, markings, marking of road edges and guiding devices				
Do all the signs (regulatory, warning and guiding) shown in the project documentation comply with the "6C" rules of fair practice of installing signs?	Yes			
Will all large racks of road signs (with a diameter of more than 100 mm) be located outside the free roadside zone, or, otherwise, have an injury-safe design?	Yes			
Is there, if necessary, an appropriate designation of the edges of the road and the direction (signs warning of a turn, signs of recommended speed, guide posts and chevron signs)?	Yes			
Do the standard drawings indicate that the signal poles should be made of plastic? Do the drawings also indicate a high-quality light return material applied to each signal column?	Yes			
Is the proposed markings clear and consistent throughout the project? Is a marking made of thermoplastic material proposed?		No		
11. Parking				
Are there any paved and marked parking areas?	Yes			
Will the parking spaces allocated be sufficient and safe?	Yes			
12. Emergency vehicle access				
Is there a possibility of safe access and movement of emergency vehicles?	Yes			
Are the gaps in the median strip sufficiently frequent, clearly visible and clearly marked with signs?		No		At intersections
13. Lighting				
Has a lighting construction been proposed for important areas (intersections, pedestrian crossings, bus stops)?	Yes			
Do the standard drawings indicate that the racks of lighting devices should have a injury-safe design?	Yes			
If the racks are not injury-safe, are other measures proposed to make them safe for road users?			NA	
14. Water disposal / drainage				
Does the project provide sufficient drainage?	Yes			
Will closed drainage ditches be used, either laid outside the free roadside zone, or protected by a road fence?	Yes			
15. General road safety considerations				
Will the new road be as safe as possible, given the local meteorological conditions (sunrise and sunset, fog, snow, wind)?	Yes			
Will the road surface be free of gravel and sand, and provide good skid resistance?	Yes			

Yes = probably satisfactory from a security point of view.
No = there are possible security issues
NA = not applicable

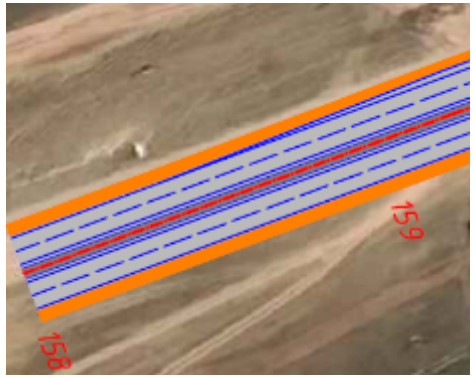
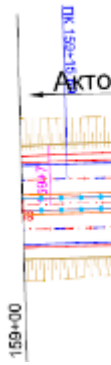
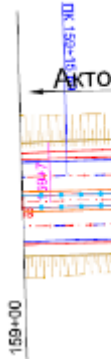
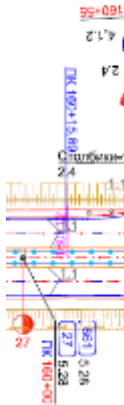
ANNEX D: MATRIX OF ROAD ATTRIBUTES

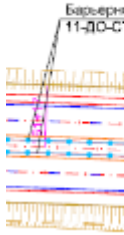
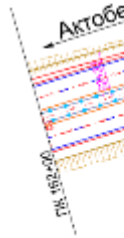
Matrix of road attributes	Current road	Project	With recommendations
Obstacles on the road - distance from the driver's side	**km**	**km**	**km**
1 to <5m	0.9	2.7	2.7
5 to <10m	1.1	0.1	0.1
>= 10m	1.1	0.3	0.3
Obstacles on the road - from the driver's side	**km**	**Km**	**km**
Metal W-beam		1.5	2.7
Signs, pillars with a diameter > = 10 cm	1.8		
Trees > = 10 cm	0.2		
Unsafe end of W-beam		1.2	
None	1.1	0.4	0.4
Obstacles on the road - the distance from the passenger side	**km**	**km**	**km**
1 to <5m	0.8	2.0	1.9
5 to <10m	0.6		
>= 10m	1.7	1.1	1.2
Obstacles on the road - from the passenger side	**km**	**Km**	**km**
Metal W-beam		1.0	2.0
Signs, pillars with a diameter > = 10 cm	1.4		
Trees > = 10 cm	0.2		
Unsafe end of W-beam		0.9	
None	1.5	1.2	1.1
Rised rib markings on the side of the road	**km**	**km**	**km**
Exist			2.2
None	3.1	3.1	0.9
Reinforced shoulders - on the driver's side	**km**	**Km**	**km**
Wide (> = 2.4m)			
Moderate (> = 1.0m to <2.4m)			
Narrow (> = 0m to <1.0m)		3.1	3.1
None	3.1		
Reinforced shoulders - on the passenger's side	**km**	**km**	**km**
Wide (> = 2.4m)			
Moderate (> = 1.0m to <2.4m)			
Narrow (> = 0m to <1.0m)		3.1	3.1
None	3.1		
Flow splitting	**km**	**km**	**km**
Not splitted	3.1	2.6	2.6
Splitted		0.5	0.5
Cost of improvements	**km**	**km**	**km**
Low	0.7	0.7	0.7
High	2.4	2.4	2.4
Type of median marking	**km**	**km**	**km**
Continuous central turning lane		0.4	0.2
Metal W-beam		0.5	0.5
None	3.1		
Wide solid marking (>1m)		0.6	0.6
Dashed strip			
Wide dashed strip (0.3m to 1m)		1.6	1.8
Rised rib central marking	**km**	**km**	**km**
None	3.1	3.1	0.9
Exist			2.1
Number of lanes	**km**	**km**	**km**
one	3.1		

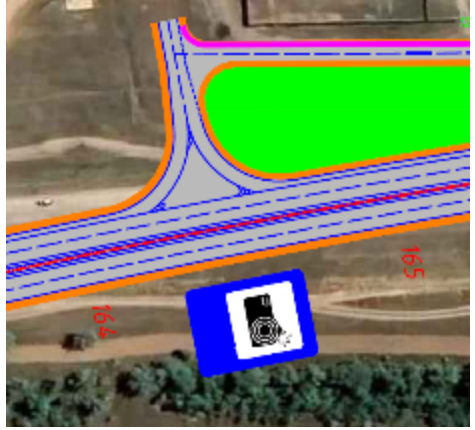
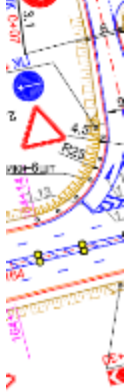
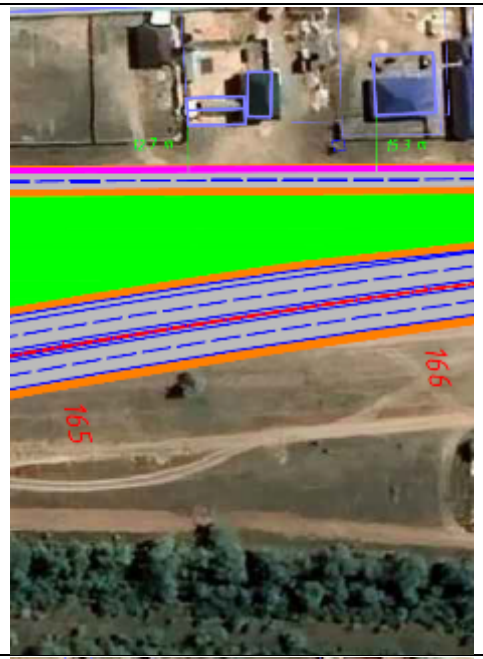
Matrix of road attributes	Current road	Project	With recommendations
two		3.1	3.1
Lane width	**km**	**km**	**km**
Wide (> = 3.25m)	3.1	3.1	3.1
Radius	**km**	**km**	**km**
Straight line or small radius	3.1	3.1	3.1
Curve type	**km**	**km**	**km**
Not applicable	3.1	3.1	3.1
Slopes	**km**	**Km**	**km**
>= 0% to <7.5%	3.1	3.1	3.1
Road pavement conditions	**km**	**Km**	**km**
Good		3.1	3.1
Bad	3.1		
Grip quality	**km**	**Km**	**km**
Good		3.1	3.1
Bad	3.1		
Marking quality	**km**	**km**	**km**
Good		3.1	3.1
Bad	3.1		
Lighting	**km**	**km**	**km**
None	3.1	1.0	1.0
Exist		2.1	2.1
Parking places	**km**	**km**	**km**
None	2.2	2.8	2.9
On the one side	0.7	0.3	0.2
On both sides	0.2		
Service road	**km**	**km**	**km**
None	3.1	1.0	1.0
Exist		2.1	2.1
Availability of road works	**km**	**km**	**km**
None		3.1	3.1
Exist	3.1		
Visibility	**km**	**Km**	**km**
Adequate	3.1	2.6	2.8
Bad		0.5	0.3
Type of intersection	**km**	**km**	**km**
Junction	0.1	0.1	0.1
3-sided without traffic lights with an additional lane for turning		0.2	0.1
3-sided without traffic light without additional lane for turning	0.6		
3-sided with a traffic light without an additional lane for turning		0.3	0.1
4-sided without traffic lights with an additional lane for turning	0.2		
4-sided with traffic lights with an additional lane for turning		0.2	0.3
None	2.2	2.2	2.1
Drainage structures at the intersection	**km**	**km**	**km**
None	3.1	2.7	2.7
Exist		0.4	0.4
Traffic at the intersection	**km**	**km**	**km**
100 to 1 000 cars per day	0.6	0.6	0.6
1 to 100 cars per day	0.3	0.3	0.3
None	2.2	2.2	2.2
Intersection quality	**km**	**km**	**km**
Adequate	0.4	0.4	0.7
Bad	0.5	0.5	
Not presented	2.2	2.2	2.4
Points in the roadside lane	**km**	**Km**	**Km**
Commercial property 1+			

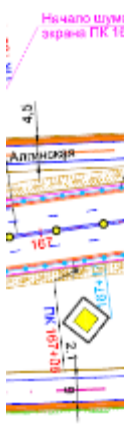
Matrix of road attributes	Current road	Project	With recommendations
1 or 2 properties	2.5	2.5	2.5
Not presented	0.6	0.6	0.6
Traffic Intensity (AADT)	**km**	**km**	**km**
15 000 – 20 000	3.1	3.1	
% of motorcyclists	**km**	**km**	**km**
1% - 5%	3.1	3.1	
Pedestrians in rush hour across the street	**km**	**km**	**km**
0	2.6	2.6	2.6
6 to 25	0.1	0.1	0.1
26 to 50	0.1	0.1	0.1
51 to 100	0.3	0.3	0.3
Pedestrian traffic during rush hour along the road on the driver's side	**km**	**km**	**km**
0	1.1	1.1	1.1
1 to 5	1.1	1.1	1.1
6 to 25	0.4	0.4	0.4
26 to 50	0.3	0.3	0.3
51 to 100	0.2	0.2	0.2
Pedestrian traffic during rush hour along the passenger side of the road	**km**	**km**	**km**
0	1.1	1.1	1.1
1 to 5	1.1	1.1	1.1
6 to 25	0.4	0.4	0.4
26 to 50	0.3	0.3	0.3
51 to 100	0.2	0.2	0.2
Cyclist traffic during rush hour	**km**	**km**	**km**
None	1.5	1.5	1.5
1 to 5	1.6	1.6	1.6
Land use - on the driver's side	**km**	**km**	**km**
Non-built-up areas	1.1	1.1	1.1
Built- up areas	1.6	1.6	1.6
Commercial facilities	0.4	0.4	0.4
Land use - on the passenger side	**km**	**km**	**km**
Non-built-up areas	1.1	1.1	1.1
Built- up areas	1.6	1.6	1.6
Commercial facilities	0.4	0.4	0.4
Type of territory	**km**	**km**	**km**
Rural / open areas	1.1	1.1	1.1
Urban	2.0	2.0	2.0
Pedestrian crossing	**km**	**km**	**km**
With a traffic light without a safety island		0.4	0.3
Marked up not raised	0.4		
Not presented	2.7	2.7	2.8
Pedestrian crossing quality	**km**	**km**	**km**
Adequate			0.4
Bad	0.4	0.4	
Not presented	2.7	2.7	2.7
Equipment for pedestrians along the road	**km**	**km**	**km**
Marking without a safety island		0.4	0.4
Not presented	3.1	2.7	2.7
Pedestrian fence	**km**	**km**	**km**
Not presented	3.1	1.4	1.2
Exist		1.7	1.9
Sidewalk – on the driver's side	**km**	**km**	**km**
Physical barrier		2.1	2.1

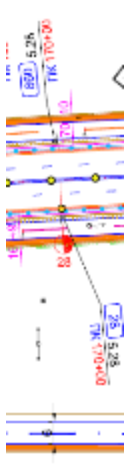
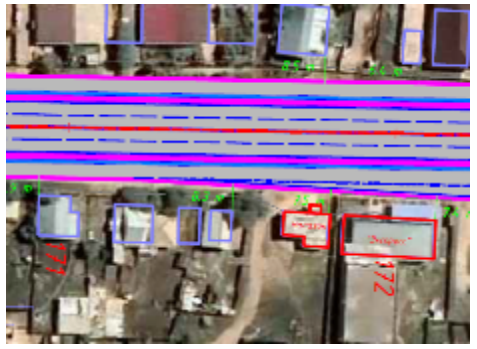
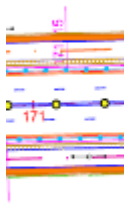
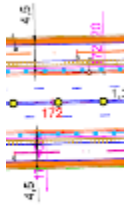
Matrix of road attributes	Current road	Project	With recommendations
Non-physical barrier width from 1.0m to <3.0m			
Informal less than 1.0m	3.1		
None		1.0	1.0
Sidewalk – passenger side	**km**	**Km**	**km**
Physical barrier		1.8	1.8
Non-physical barrier width from 1.0m to <3.0m			
Informal less than 1.0m	3.1		
None		1.3	1.3
Equipment for motorcyclists	**km**	**km**	**km**
None	3.1	3.1	3.1
Equipment for cyclists	**km**	**Km**	**Km**
None	3.1	3.1	3.1
Availability of a school zone	**km**	**Km**	**Km**
None	3.1	3.1	3.1
Set speed limit	**km**	**Km**	**km**
40 km/h	2.3		
50 km/h			1.9
60 km/h	0.4	2.3	0.6
80 km/h	0.4	0.4	0.4
90 km/h			
100 km/h		0.4	0.2
The set speed limit for motorcycles	**km**	**km**	**Km**
40 km/h	2.3		
50 km/h			1.9
60 km/h	0.4	2.3	0.6
80 km/h	0.4	0.4	0.4
90 km/h			
100 km/h		0.4	0.2
The set speed limit for trucks	**km**	**km**	**km**
40 km/h	2.3		1.9
60 km/h	0.4	2.3	0.6
80 km/h	0.4	0.4	0.4
90 km/h			
100 km/h			0.2
Split speed mode		**km**	**km**
Not presented	3.1	3.1	3.1
Calming the flow rate	**km**	**km**	**km**
Not presented	3.1	2.7	2.7
Speedometer		0.4	0.4
Operating speed (85th percentile)	**km**	**km**	**km**
50 km/h	2.3		1.9
70 km/h	0.4	2.3	0.6
90 km/h			0.4
100 km/h	0.4	0.4	0.2
110 km/h		0.4	
Operating speed (value)	**km**	**km**	**km**
40 km/h			
50 km/h			1.9
60 km/h	2.3	2.3	0.6
80 km/h	0.4	0.4	0.4
100 km/h	0.4	0.4	0.2

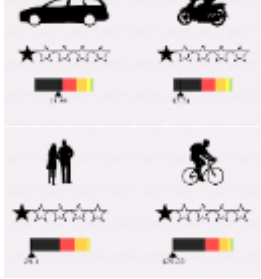
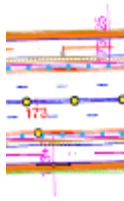
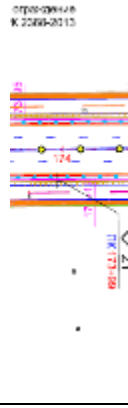
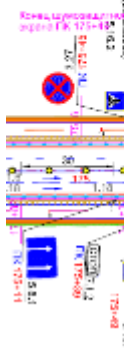
#	PK	Name	Photo	Note	SR iRAP – current road	Project road (sketch as of 08.04.2023)	Pro
1	158	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.060260899997985&lng=57.346411600000001&z=16.067480318216308&pKey=297702615987889&focus=photo			
2	159	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.0594868&lng=57.3467248&z=17&pKey=2092933452493 47&focus=photo			
3	160	The exit to the cemetery		https://www.mapillary.com/app/?lat=50.059229600000001&lng=57.34682520000001&z=16.067480318216308&pKey=779023420492041&focus=photo			

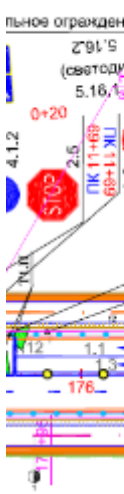
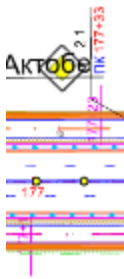
4	161	Entrance to the village of Bestamak		/app/?lat=50.05739839998&lng=57.347455400002&z=17&pKey=948654406175766&focus=photo			
5	162	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.056478&lng=57.34778470000106&z=16.067480318216308&pKey=774115444368663&focus=photo			
6	163	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.055033300001&lng=57.3477112&z=17&pKey=633327235313093&focus=photo			

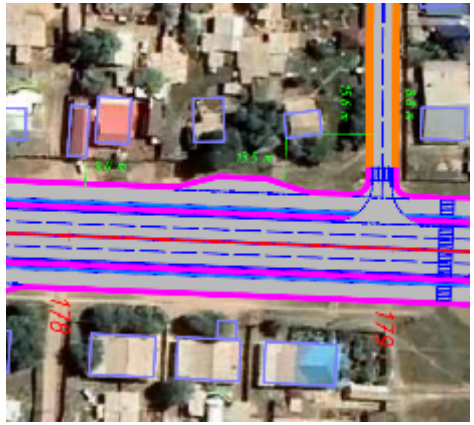
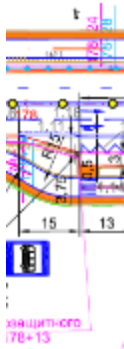
7	164	Exit		/app/?lat=50.0543240999 98986&lng=57.34769879 999999&z=16.067480318 216308&pKey=27049774 2042365&focus=photo			
8	165	Main street, the beginning of the noise screen and guard rails - on the driver's side		https://www.mapillary.com /app/?lat=50.0537672&ln g=57.3476818&z=17&pK ey=12899416716049 97&focus=photo			
9	166	Bus stop - on the driver’s side		https://www.mapillary.com /app/?lat=50.0525925925 93&lng=57.3476085&z=1 7&pKey=1409771906453 558&focus=photo			

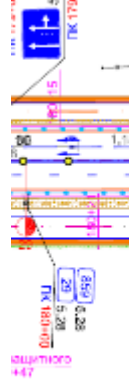
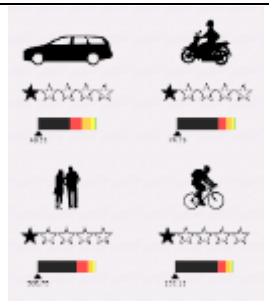
10	167	Bus stop - on the passenger's side		/app/?lat=50.0518934000 02&lng=57.3475908&z=17&pKey=238778105430689&focus=photo			
11	168	Intersection		https://www.mapillary.com/app/?lat=50.051092900002&lng=57.347597100002&z=17&pKey=3437351499867559&focus=photo			
12	169	CSS		https://www.mapillary.com/app/?lat=50.049904100002&lng=57.34750670000096&z=16.067480318216308&pKey=1607801413073565&focus=photo			

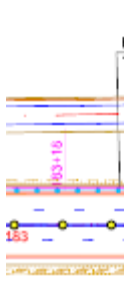
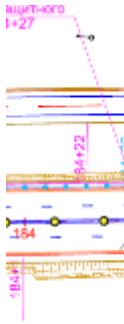
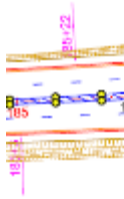
13	170	Main street, drugstore		/app/?lat=50.0494236999 9804&lng=57.347415599 99998&z=16.0674803182 16308&pKey=102630831 1880395&focus=photo			
14	171	Main street		https://www.mapillary.com /app/?lat=50.0489505&ln g=57.3472868&z=17&pK ey=12984955677125 90&focus=photo			
15	172	Shop “Express”		https://www.mapillary.com /app/?lat=50.0480904&ln g=57.347092605887&z=1 7&pKey=1592750536101 13&focus=photo			

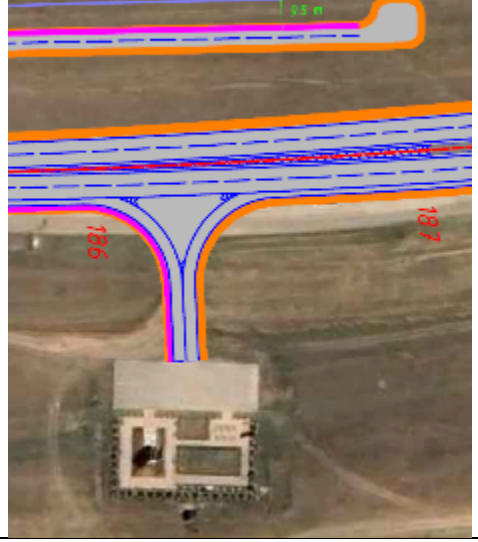
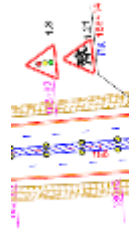
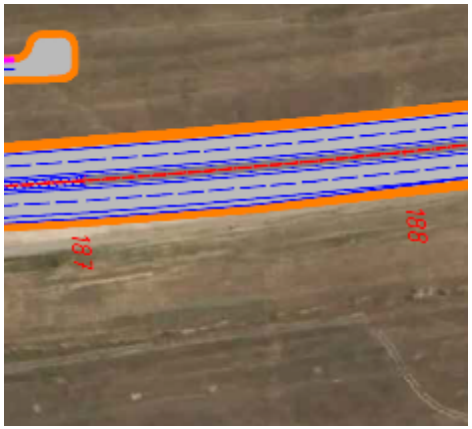
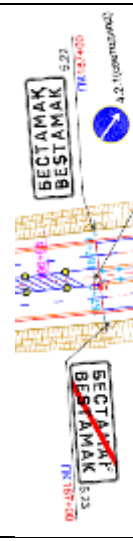
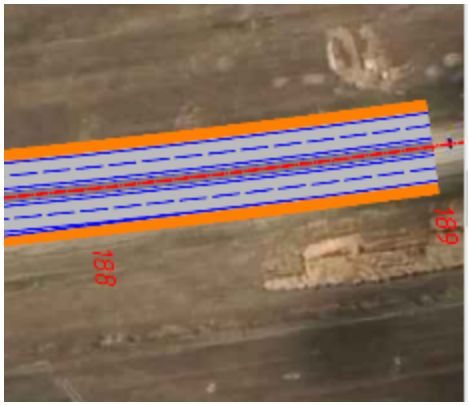
16	173	Mosque		/app/?lat=50.046033&lng=57.346777900012&z=17&pKey=765069278426278&focus=photo			
17	174	Shop “Amina”		https://www.mapillary.com/app/?lat=50.046083800003&lng=57.3466515&z=17&pKey=266417459175280&focus=photo			
18	175	Exit		https://www.mapillary.com/app/?lat=50.0451372&lng=57.346469&z=17&pKey=651388606809175&focus=photo			

19	176	Main street		/app/?lat=50.044607299999&lng=57.3463966&z=17&pKey=203401088764590&focus=photo			
20	177	Shop		https://www.mapillary.com/app/?lat=50.042933900001&lng=57.3460688&z=17&pKey=939376037284048&focus=photo			

21	178	Intersection - bus stop - discrepancies		/app/?lat=50.0421193&lng=57.345893300002&z=17&pKey=1265461077509407&focus=photo			
22	179	Cafe "Urker", "Caravan"		https://www.mapillary.com/app/?lat=50.0416988&lng=57.3457924&z=17&pKey=261775549738975&focus=photo			

23	180	Shop		/app/?lat=50.040373499999999&lng=57.3455295&z=16.067480318216308&pKey=155912217465357&focus=photo			
24	181	Shop, intersection, bus stop		https://www.mapillary.com/app/?lat=50.0398442&lng=57.345379699999&z=17&pKey=974670300644378&focus=photo			
25	182	Bus stop Exit to the gas station		https://www.mapillary.com/app/?lat=50.038394399999999&lng=57.345050399999999&z=15.002891473131598&pKey=1317444235784449&focus=photo			

26	183	Main street, bus stop		/app/?lat=50.037960299998&lng=57.344954200002&z=17&pKey=619626856768039&focus=photo&x=0.4866506690835163&y=0.5865873565177893&zoom=0			
27	184	Main street		https://www.mapillary.com/app/?lat=50.036889300002&lng=57.344735400002&z=17&pKey=1175222239811438&focus=photo			
28	185	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.0361335&lng=57.3446015&z=17&pKey=629792059045120&focus=photo			

29	186	Exit to the monument		/app/?lat=50.03488&lng=57.344536600002&z=17&pKey=267425365692414&focus=photo			
30	187	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.033654699999&lng=57.344648300002&z=15.002891473131598&pKey=215872931248213&focus=photo			
31	188	Entrance to the village of Bestamak		https://www.mapillary.com/app/?lat=50.032902100002&lng=57.3446916&z=17&pKey=163236156507265&focus=photo			

ANNEX F: COST OF COUNTERMEASURES FOR KAZAKHSTAN

Data on the cost of countermeasures are given in KZT in the prices of 2023
The data collected on this tab is used to estimate the cost of countermeasures and for economic analysis.
The data currently shown in the white cells is only sample data and can be used to generate the source data in the local currency/country using a multiplier for the values given below.

№	Countermeasure	Name	Unit	Life cycle	Rural roads			City roads		
					Low	Moderate	High	Low	Moderate	High
1	Improve marking	Individual	lane km	3	1692279	2538419	3807628	1856248	2784372	4176558
2	Cycle path (on the main road)	Individual	km	20	25365874	38048811	57073217	23941315	35911972	53867958
3	Cycle path (outside the main road)	Individual	km	20	39273317	58909976	88364964	32440772	48661158	72991737
4	Motorcycle lane (Only signs on the road)	Individual	km	5	1287322	1930983	2896475	1336407	2004611	3006916
5	Motorcycle lane (Separate) (3.6 m wide sidewalk)	Individual	km	20	27554342	41331513	61997270	34167384	51251076	76876614
6	Motorcycle Lane (Separate)	Individual	km	20	67311381	100967072	151450608	42631422	63947133	95920699
7	Horizontal alignment (one category higher)	Individual	lane km	20	297417932	446126898	669190347	199155686	298733529	448100293
8	Improving curve marking	Individual	lane km	3	3837517	5756276	8634414	3895360	5843039	8764559
9	Lane widening (up to 0.5m)	Individual	lane km	10	9472300	14208451	21312676	7551941	11327912	16991867
10	Lane widening (> 0.5m) (for every next 0.5m)	Individual	lane km	10	16437132	24655699	36983548	12478570	18717855	28076783
11	Protected turn lane (non-signalised 3-sided)	Individual	intersection	10	1661069	2082513	2665538	1608115	1831926	2041227
12	Protected turn lane (non-signalised 4-sided)	Individual	intersection	10	2254807	3054295	2933612	2141668	2659634	2952470
13	Marking and road signs (intersection)	Numerous	intersection	3	2508220	3762330	5643495	2789250	4183875	6275813
14	Arrangement of a protected turn-lane at an controlled intersection (3-sided)	Individual	intersection	10	38551619	57827428	86741142	38551619	57827428	86741142
15	Arrangement of a protected turn-lane at an controlled intersection (4-sided)	Individual	intersection	10	38551619	57827428	86741142	38551619	57827428	86741142
16	Controll the intersection (3-sided)	Numerous	intersection	20	77513660	116270490	174405735	77513660	116270490	174405735
17	Controll the intersection (4-sided)	Numerous	intersection	20	115509758	173264638	259896956	115509758	173264638	259896956
18	Split-level crossing	Numerous	intersection	20	4063874062	6095811093	9143716640	4063874062	6095811093	9143716640
19	Railway crossing improvement	Numerous	intersection	20	649289149	973933724	1460900586	649289149	973933724	1460900586
20	Roundabout (II-technical category of road)	Numerous	intersection	20	121048034	181572050	272358075	96948321	145422481	218133722
21	Median dash-line marking	Individual	km	10	1154422	1731633	2597450	1154422	1731633	2597450
22	Rised rib-markings	Individual	km	10	899500	1349250	2023875	899500	1349250	2023875
23	Full length of the central turning lane	Individual	km	10	982817	1474225	2211337	1017977	1526965	2290448
24	Fencing of the median strip (without doubling)	Numerous	km	10	30348174	45522261	68283392	30220058	45330088	67995131
25	Doubling of the road with the median strip fencing	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
26	Doubling of the road - <1m median strip	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
27	Doubling of the road - 1-5 m median strip	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
28	Doubling of the road - 5-10 m dividing strip	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
29	Doubling of the road- 10-20 m dividing strip	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
30	Doubling of the road - > 20 m median strip	Only undivided	per km of roadway	20	72872238	109308357	163962536	72583009	108874514	163311771
31	Service road	Individual	km	20	18170599	27255899	40883848	10788440	16182660	24273990
32	Additional lane (road 2+1)	Individual	km	20	302427313	453640969	680461453	205293806	307940709	461911064
33	Apply one-way traffic to the road network	Only undivided	per km of roadway	20	817463	1226194	1839291	826281	1239422	1859133
34	Improving the quality of the pedestrian crossing	Individual	pcs.	10	231044	346566	519850	229870	344805	517207
35	Safety Island	Individual	pcs.	10	562120	843180	1264770	281060	421590	632385
36	Non-controlled crossing	Numerous	pcs.	10	231044	346566	519850	229870	344805	517207
37	Controlled crossing	Numerous	pcs.	20	4014573	6021860	9032790	4013398	6020096	9030145

№	Countermeasure	Name	Unit	Life cycle	Rural roads			City roads		
					Low	Moderate	High	Low	Moderate	High
38	Split-level pedestrian crossing (overpass)	Numerous	pcs.	20	300765384	451148076	676722114	300765384	451148076	676722114
40	Restoration of the road surface (II technical category of the road)	Individual	per km of roadway	10	33923415	50885122	76327684	25381847	38072771	57109156
41	Removal of dangerous objects - from the passenger side	Individual	per linear km	20	3788304	5682456	8523684	3788304	5682456	8523684
42	Removal of dangerous objects - from the driver's side	Individual	per linear km	20	3788304	5682456	8523684	3788304	5682456	8523684
43	Improvement of the side slope - from the passenger side	Individual	per linear km	20	39356765	59035148	88552722	39122157	58683236	88024854
44	Improvement of the side slope - from the driver's side	Individual	per linear km	20	39356765	59035148	88552722	39122157	58683236	88024854
45	Guard rails - on the passenger side	Individual	per linear km	20	36436119	54654179	81981268	36291505	54437258	81655887
46	Guard rails - on the driver's side	Individual	per linear km	20	36436119	54654179	81981268	36291505	54437258	81655887
47	Strengthening of the shoulder on the passenger side (<1m)	Individual	per linear km	20	5069120	7603680	11405520	3869197	5803795	8705693
48	Strengthening of the shoulder on the passenger side (>1m)	Individual	per linear km	20	5069120	7603680	11405520	3869197	5803795	8705693
52	Restrict/merge access roads	Individual	km	10	131426266	197139399	295709099	90148614	135222920	202834381
54	Provision of a pedestrian path on the passenger side (adjacent to road)	Individual	km	20	34167384	51251076	76876614	22993559	34490339	51735508
55	Provision of a pedestrian path on the passenger side (>3m from road)	Individual	km	20	34167384	51251076	76876614	22993559	34490339	51735508
56	Checks of speed control means	Individual	per km of roadway	5	61732030	92598045	138897068	61732030	92598045	138897068
57	Reducing traffic tension	Individual	per km of roadway	10	213037	319555	479333	208097	312145	468218
59	Vertical alignment (basic)	Individual	lane km	20	132996012	199494018	299241027	109806635	164709953	247064929
60	Overtaking lane or additional lane	Individual	per linear km	20	69584078	104376117	156564176	44789420	67184130	100776195
61	Improving the passage on the median strip	Numerous	intersection	10	69584078	104376117	156564176	44789420	67184130	100776195
62	Removal of dangerous objects (bicycle path)	Individual	km	20	159703	239555	359332	159703	239555	359332
63	Improvement of the side slope (bicycle path)	Individual	km	20	1298667	1948000	2922000	1377412	2066118	3099177
64	Guard rails (bicycle path)	Individual	km	20	36134437	54201656	81302483	36291505	54437258	81655887
65	Removal of dangerous objects (separated motorcycle lane) from the passenger side	Individual	km	20	4537100	6805650	10208475	4537100	6805650	10208475
66	Side slope improvement (separated motorcycle lane) from the passenger side	Individual	km	20	12543642	18815462	28223194	12504755	18757133	28135699
67	Guard rails (separated motorcycle lane) from the passenger side	Individual	km	20	36134437	54201656	81302483	36291505	54437258	81655887
68	Checks of speed control means (motorcycle lane)	Individual	per km of roadway	5	76547717	114821576	172232364	76547717	114821576	172232364
69	Fencing of the central median strip (motorcycle lane)	Numerous	km	10	36436119	54654179	81981268	36291505	54437258	81655887
71	Slip resistance (paved road)	Individual	lane km	10	5850600	8775900	13163850	5808600	8712900	13069350
72	Slip resistance (unpaved road)	Individual	per km of roadway	10	15211560	22817340	34226010	15102360	22653540	33980310
73	Asphalt paving of the road	Individual	lane km	10	187265453	280898180	421347270	171349805	257024708	385537062
74	Street lighting (mid-block)	Individual	lane km	20	41383931	62075897	93113845	41383931	62075897	93113845
75	Street lighting (intersection)	Individual	intersection	20	69515435	104273153	156409730	69515435	104273153	156409730
76	Street lighting (ped crossing)	Individual	pcs.	20	526632	789948	1184921	526632	789948	1184921
77	Rised rib markings on the road sides	Individual	per km of roadway	10	7082880	10624320	15936480	7082880	10624320	15936480
78	Parking improvements	Individual	per km of roadway	20	1756575	2634863	3952294	1830308	2745462	4118193
79	Visibility distance ((removal of obstacles)	Individual	per km of roadway	20	319408	479112	718668	319408	479112	718668
80	Pedestrian fences	Individual	per km of roadway	20	36134437	54201656	81302483	36247555	54371332	81556998
81	Split-level pedestrian crossing on a bypass road	Individual	intersection	20	15783572	23675358	35513037	15783572	23675358	35513037
152	Controlled pedestrian crossing on a bypass road	Individual	pcs.	20	4014573	6021860	9032790	4013398	6020096	9030145
153	Non-controlled pedestrian crossing on a bypass road	Individual	intersection	10	231044	346566	519850	229870	344805	517207
163	Provision of a pedestrian path on the passenger side (with fencing)	Individual	km	20	15304094	22956140	34434211	15255260	22882890	34324335
164	Provision of a pedestrian path on the passenger side (unofficial path >1m)	Individual	km	10	4014573	6021860	9032790	4013398	6020096	9030145

№	Countermeasure	Name	Unit	Life cycle	Rural roads			City roads		
					Low	Moderate	High	Low	Moderate	High
178	Provision of a pedestrian path on the driver's side (unofficial path >1m)	Individual	km	10	4014573	6021860	9032790	4013398	6020096	9030145
177	Provision of a pedestrian path on the driver's side (with fencing)	Individual	km	20	15304094	22956140	34434211	15255260	22882890	34324335
174	Providing a pedestrian path on the driver's side (>3m from the road)	Individual	km	20	34167384	51251076	76876614	22993559	34490339	51735508
173	Provision of a pedestrian path on the driver's side (adjacent to the main road)	Individual	km	20	34167384	51251076	76876614	22993559	34490339	51735508
171	Strengthening of the shoulder on the driver's side (<1m)	Individual	per linear km	20	5069120	7603680	11405520	3869197	5803795	8705693
172	Strengthening of the shoulder on the driver's side (>1m)	Individual	per linear km	20	5069120	7603680	11405520	3869197	5803795	8705693
182	Alignment (improved visibility distance)	Individual	lane km	20	164915055	247372582	371058873	136160227	204240341	306360512
186	Fencing of the central median strip (1+1)	Only undivided	km	20	37631736	56447604	84671405	37472872	56209308	84313962
187	Removal of dangerous objects (separated motorcycle lane) from the driver's side	Individual	km	20	3788304	5682456	8523684	3788304	5682456	8523684
188	Side slope improvement (separated motorcycle lane) from the driver's side	Individual	km	20	1420742	2131114	3196670	1377412	2066118	3099177
189	Guard rails (separated motorcycle lane) from the driver's side	Individual	km	20	37631736	56447604	84671405	37472872	56209308	84313962
190	Wide central line	Only undivided	per linear km	20	760981	1141472	1712207	737076	1105614	1658421
191	School Zone Warning - signs and markings	Individual	lane km	5	5668974	8503461	12755191	5668904	8503356	12755035
192	Warning lights at the school zone	Individual	pcs.	20	3811883	5717824	8576736	4256161	6384242	9576363
193	School zone - traffic controller or pedestrian crossing observer	Only undivided	pcs.	1	277760	416640	624960	277760	416640	624960
194	Unregulated raised crossing	Numerous	pcs.	10	5667620	8501429	12752144	5667591	8501387	12752080

ANNEX G: PRICE QUOTATION

Скоростемеры

«Көркем Телеком» ЖШС
010000, Астана қаласы,
Есіл ауданы,
Тұран данғылы, 9Б
ғимараты
тел.: 8 (7172) 57-51-11

ТОО «Көркем Телеком»
010000, г. Астана,
район Есиль,
проспект Тұран, здание 9Б
info@sergekgroup.kz

№ КТ/246/07 от 07.06.2023 г.

Коммерческое предложение

ТОО «Коркем Телеком» (далее – Товарищество) возглавляет группу казахстанских компаний Sergek Group, работающих с 2006 года в сфере информационных технологий, связи, телекоммуникаций и системных интеграций.

Товарищество направляет коммерческое предложение на поставку, монтаж аппаратно-программного комплекса «Сергек», а также организацию каналов связи, обслуживание и передачу данных о нарушениях скоростного режима транспортных средств на участке «Актобе - Кандыагаш» п. Бестамак Актюбинской области.

№	Наименование	Кол-во	Цена за единицу, тг
1	АПК «Сергек» - **Линейный участок**	1	5 000 000
2	Начальная обработка данных	1	650 000
3	Организация каналов связи	1	390 000
4	Монтаж/пусконаладка ЛУ	1	200 000
5	Поверка	1	130 000
	Итого установка, монтаж, запуск линейного участка		**6 370 000**
1	АПК «Сергек» **Перекресток**	1	13 000 000
2	Начальная обработка данных	1	650 000
3	Организация каналов связи	1	390 000
4	Монтаж/пусконаладка П	1	300 000
5	Поверка	1	210 000
	Итого установка, монтаж, запуск Перекресток		**14 550 000**

Обслуживание

№	Наименование	Кол-во	Итого в месяц
1	АПК «Сергек» **Линейный участок**	1	200 000
2	АПК «Сергек» **Перекресток**	1	250 000
3	Обслуживание и поддержка ПО	1	500 000
4	Передача данных	1	390 000

Генеральный директор **А. Ахметов**

Исп. Е.Тулегенов
+7 778 000 09 25

ASIA GREAT

ЖАУАПКЕРШІЛІГІ ШЕКТЕУЛІ СЕРІКТЕСТІГІ « АЗИЯ ГРЕЙТ »
Қазақстан Республикасы,
Алматы қ., Навои к-сі 58
+ 7(727)222 00 36
almaty.asiagreat@gmail.com
www.asiagreat.kz

ТОВАРИЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ « АЗИЯ ГРЕЙТ »
Республика Казахстан,
г. Алматы, ул. Навои 58
+ 7(727)222 00 36
almaty.asiagreat@gmail.com
www.asiagreat.kz

исх. №122-АГ от 012 сентября 2022 года

Коммерческое предложение

Направляем в Ваш адрес коммерческое предложение на поставку и монтаж АПК SPEED-R.

№	Наименование	Кол-во	Цена за ед.	Стоимость
1	Опора для камеры видеонаблюдения (включа монтаж)	1	710 000	710 000
2	Аппаратный шкаф Укомплектованный: ИБП Комммутатор БП 24VDC Трансформатор понижающий 24VAC	1	497 000	497 000
3	GSM Связь	1	71 000	71 000
4	Промышленный компьютер	1	543 150	543 150
5	ОС Windows	1	177 500	177 500
6	Солнечная установка	1	3 504 560	3 504 560
7	Vidar Speed 5MpHDx, LT (U) 4D-Radar	1	7 711 246	7 711 246
8	Интеграция ДВД (ЕРАП) Алматинская область	1	656 040	656 040
9	Метрологическая поверка	1	681 600	681 600
	Итого без НДС			**14 552 096**
	Итого с НДС			**16 298 348**

**Срок поставки составляет 5-8 недель*

Директор **Р. Хайбуллина**

Тел.: +7 701 191 00 05

Шумовые экраны

АКЦИОНЕРНОЕ ОБЩЕСТВО
ЗАВОД АКУСТИЧЕСКИХ КОНСТРУКЦИЙ

188673, Российская Федерация, Ленинградская область, м.р-н Всеволожский, с.п. Новодевяткинское, д. Новое Девяткино, тер. Производственная, ул. Промышленная, зд. 38, помещ.1Б

Тел./факс: (812) 383-53-90
E-mail: acoustic@zac-spb.ru
www.zac-spb.ru

02.06.2023 № 300

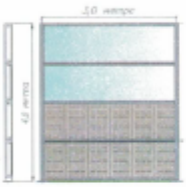
на № _____ от _____

О стоимости шумозащитного экрана

ТОО "Innovation Consulting Group"
Директору
Нурметов С.Ш.

Уважаемый Серик Шарипжанович!

В ответ на Ваш запрос сообщаем, что стоимость изготовления шумозащитного экрана высотой 4м, с основным шагом стоек 3м, протяженностью 3 057 п.м., общей площадью 12 228м^2, предполагаемого к установке на объекте: «Реконструкция, а/д республиканского значения А-27 "Актобе-Атырау-граница РФ (на Астрахань), км 11-52», ориентировочно составит: **8 170 руб/м^2 (99 902 760 руб.)**



Стоимость изготовления шумозащитного экрана рассчитана по состоянию на **июнь 2023 г.** с учетом **НДС 0%** на условиях поставки самовывоз (пункт отгрузки – Санкт-Петербург) и может быть уточнена после разработки конструкторской документации.

В указанную стоимость входят:
- стойки прямые из двутавра **16Б1** в сборе (прижимные уголки и ограничители);
- шумозащитные ударопрочные панели (нижний ряд);
- шумопоглощающие панели;
- шумоотражающие прозрачные панели;
- комплект профилей (горизонтальные и опорный).

В указанную выше стоимость **не входят** затраты на устройство фундаментов, крепление стоек к фундаменту, доставку до объекта и монтаж конструкции.

Дополнительно сообщаем Вам, что для транспортировки Продукции потребуется 35 а/м типа «Еврофура» с боковой загрузкой и длиной кузова 13,6п.м. Стоимость доставки на объект в Республику Казахстан до ж/д. станции Алга по состоянию **на июнь 2023г.** ориентировочно составит: **9 450 000 руб.**

Вместе с готовой Продукцией АО «ЗАК» передает Заказчику: сборочные чертежи, инструкцию по монтажу экрана, паспорт на изделие, сертификаты соответствия и разработанную конструкторскую документацию.

Шумозащитные экраны изготавливаются по **ТУ 5262-001-13831917-2011;** в соответствии с **СТО 5284-001-13831917-2015,** согласованным с **ГК «Автодор»** и сертифицированы в системе ГОСТ Р Госстандарта РФ.

Применяемые материалы шумозащитного экрана:

Ударопрочные шумозащитные панели (нижний ряд экрана) изготавливаются из горячеоцинкованной стали с полимерным покрытием (цвет по согласованию). Данное покрытие обеспечивает высокую коррозионную защиту, имеет высокую стойкость к истиранию, не выцветает. Панели отличаются повышенной ударопрочностью.

Для изготовления *стандартных шумопоглощающих панелей* применяется горячеоцинкованная сталь с полимерным покрытием (цвет по согласованию). Наполнение – минеральная вата.

Прозрачные шумоотражающие панели изготавливаются из листа полиметилметакрилат (прозрачного нетонированного) толщиной 12мм. На объект поставляются в сборе готовые к монтажу.

Металлоконструкции экрана (стойки, комплект профилей) подвергаются горячему цинкованию.

Гарантия на шумозащитный экран – 5 лет.

Финансовый директор-
первый зам. ген. директора М.А.Воронов

Исп. Ищенко Виктория Алексеевна
тел:(812) 384-45-61 моб. (911) 211-59-01 e-mail: iva@zac-spb.ru

ПромДорАкустика
Шумозащитные и ветро-пылезащитные экраны
ООО «ПромДорАкустика»
Тел.: 8(812) 495-95-93
www.pdaa.ru

Исх. № 06/2352 для Даулет
от 09 июня 2023 г. объект Казахстан

Коммерческое предложение

Компания «ПромДорАкустика» готова выполнить комплекс работ по производству и строительству шумозащитнного экрана с индексом изоляции 38 dBA.

На Ваш запрос мы предлагаем Вам:

- Изготовить согласно документации деталей конструкции;
- Выполнить строительно-монтажные работы на Вашем объекте.

		длина, м	3057	высота, м	4
№	Товары (работы, услуги)	Кол-во	Ед. изм.	Цена, руб	Сумма, руб с НДС 20%
1	Панели шумозащитные антивандальные ПШО-У, без перфорациии, 38 dBA, профессиональная акустическая базальтовая вата , НГ, окрашенные RAL, "ПромДорАкустика" ТУ 5284-002-33107233-2015	6114	кв.м.	4950	30264300
2	Панели шумоотрожающие прозрачные ПШО-СП., "ПромДорАкустика" ТУ 5284-003-33107233-2015	6114	кв.м.	7950	48606300
3	Стойка Ст-1, Н= 3м	1020	шт.	14592	14883840
4	Прижимной уголок	8160	шт.	650	5304000
5	Комплект крепежа	7	компл.	38000	266000
			ИТОГО	99 324 440,00 ⊡	
			в том числе НДС 20 %	16 554 073,33 ⊡	

1	Стоимость проектирования	
	Сроки проектирования	5 дней
2	Стоимость изготовления шумозащитного экрана	99 324 440,00 ⊡
	Сроки изготовления и начало поставки	90 дней
3	Стоимость СМР	
	Сроки работ	дней
4	ИТОГО	99 324 440,00 ⊡

Срок производства и строительства 90 дней
Авансирование:
- Аванс на материалы - 70%, аванс на работы 50%, далее согласно графику производства

Гарантия 5 лет.

Менеджер по продажам, Армасов Руслан
моб. тел.: +7 981 811 05 50
m1@pdaa.ru

Монолитный поликарбонат Шумозащитные экраны

TOO ALSTROY HOLDING

Приблизительный расчет стоимости шумозащитного экрана (Монолитный поликарбонат 6мм) по рисунку № 1

Наименование	ед.изм.	кол-во	цена	итого
Монолитный поликарбонат 2050*3050*6мм	лист	2	106000	212000
Труба 100*100*4	метр	8	4446	35568
Труба 60*40*3	метр	17	1530	26010
Профиль алюминиевый прижимной с уплотнительной резиной	метр	12	2000	24000
Термошайба	штука	4	20	80
Краска	литр	4	1750	7000
Бетон	метр кв.	0,25	15000	3750
Приблизительная стоимость всех работ				40000
Накладные расходы				10000
ИТОГО				**358408**

Из этого расчета становиться ясно, что приблизительная стоимость 1 метра кв. данного шумозащитного экрана,изготовленного и установленного по месту составляет **28 385** тенге за м.кв.

Погонного метра - **86 155** тенге.

Ориентировочная стоимость проекта L 4,300 м.п. - 370 466 500 тенге.